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GOV. RUSSELL has appointed Senator McDonald to the vacancy in the Massachusetts Board of Gas and Electric Light Commissioners caused by the resignation of Col. Coveney. He has also appointed Mr. J. T. Leary to be Clerk of the Commission, vice Mr. Walter Allen, resigned. Mr. Allen will take a trip to Europe, following which he will accept a responsible position with the Boston Gas Light Company.

THE FAIR FUND.

During the week slow progress was made in the matter of increasing the Fair Fund, but one pleasing thing in connection with the sums pledged was the subscription announced by the Milwaukee Company; in that it followed immediately after the annual meeting of the shareholders. The increased subscription of the Citizens Company, of Newark, N. J., also puts that Company much nearer to the section of the list to which, from its magnitude, it properly belongs. The Logansport pledge is also a generous one. The following is the state of the subscription, up to the evening of July 21st:

July 14. Logansport (Ind.) Gas Light and Coke Co.	$50 00
" 15. Milwaukee (Wis.) Gas Light Co.	500 00
" 21. Wm. Tracy, Alton, Ill.	10 00
Total.	$560 00
Increased Subscription.	
July 18. Citizens' Gas Light Co., Newark, N. J., from $250 to $500—increase.	$250 00
Total for the week.	$810 00
Amount previously published.	65,745 28
Grand total (to July 21).	$66,555 28

OBITUARY—THE HONORABLE A. M. NORTON.

Our brief announcement in the JOURNAL for last week of the very sudden death of the Hon. Alfred Metcalf Norton, Treasurer and Manager of the Light, Heat and Power Company, of Nashua, N. H., has called forth many expressions of sorrow, for Mr. Norton was well known to the fraternity of the country, and especially to those resident in the New England and Middle States; furthermore, deceased enjoyed the esteem and respect of all who had either business or social relations with him. Deceased had been a sufferer for some years from heart trouble, but when the swift summons came (at an early hour on the 13th) none were more shocked than the members of his family, for on the previous afternoon he had completed the arrangements necessary to the enjoyment of his usual summer vacation. We herewith print a concise account of the main points in Mr. Norton's long, honorable and useful life, and wish to acknowledge our indebtedness to the Nashua Company, and to Mr. Chas. F. Prichard, for material aid in the compilation of the same.

Alfred Metcalf Norton was born in Greenland, N. H., on April 13, 1822, and received his preliminary education in the common schools of that town, graduating thereafter with high honors from the Brackett Academy. Electing to follow the profession of a gas engineer, he entered the service of the Boston Gas Company, and his aptitude was such that, in 1853, he was appointed Manager of the Dover (N. H.) Company. He remained at that point until 1861, when an available chance for promotion came to him in the shape of a call for his services from the East Boston (Mass.) Company. He acted as Manager of that Company until 1874, when the proprietors of the Nashua Gas Company selected him as Manager, they subsequently adding thereto the duties of Treasurer. On the reorganization of the Nashua Company, when the Company's corporate title was changed to that of the Nashua Light, Heat and Power Company, Mr. Norton was retained as Manager and Treasurer—a just tribute to his capacity as an engineer and to his ability as a business man. Death found him there, but death cannot blot out the record that he made in his profession.

As an engineer he is acknowledged for many years to have been in the foremost rank; as a financier, he was prudent and successful; as a manager of those under his immediate direction, he was the wise counsellor, the watchful controller, and the true friend. In the two score

of years devoted by him to the gas business he was ever on the alert to foster its position, to advance its interests. He was a staunch advocate of low prices, of good quality, and of fair treatment of those that his Companies served.

His connection with the Associations devoted to promoting the welfare of our industry are, so far as we have been able to determine, membership in the New England Association of Gas Engineers, and also in the American Gas Light Association. While we cannot state the exact time of his admission to the New England Association, we know that he was one of those who attended the funeral of ex-Mayor Blake, of Worcester, Mass., in December, 1870, and, therefore, presume that he was one of the Association's organizers. He was chosen on the Board of Directors at the 13th annual (1883) meeting, was elected Second Vice-President in 1884–85, going to the First Vice-Presidency in 1886–87, was elected President at the 18th annual (1888) meeting, and presided over the 19th annual (1889) meeting—a feature of the technical side of that gathering was the excellent address delivered by him. At the '87 meeting he contributed a most excellent paper on the subject of "The Effect of Reduction in Price of Gas," that had much influence on many of his brother managers; for it was noted that shortly thereafter several Companies (some of which were quite small) announced material concessions in gas rates. He was a constant attendant at the meetings of the Association, and, besides the official positions above mentioned as having been held by him, he served it greatly by unassuming, but diligent and effective work on committees. He was elected to membership in the American Association at the 1879 meeting, and while he never took any very active part in its administration, he was regular in his attendance at its assemblies. Apart from his connection with the gas industry, his career was that of a successful man, and although he did not take active part in what might be termed actual politics, his fellow citizens of Nashua twice insisted on placing him in the Mayor's chair. His Mayoralty terms covered the years 1883 and 1884, and that he did credit to himself and that he served the public faithfully is shown in the following lines, respecting his occupancy of the office, taken from an obituary notice published in the Nashua *Daily Telegraph:* "It is a matter of record, as well as memory, with the citizens of both political parties, that Nashua never had a more courteous, able and fair-minded man as its chief executive, or one who upon his retirement from a public trust, had more kind words spoken of him by newspapers and acquaintances not of the political party whose candidate he was for that office. Many of the improvements the citizens are now enjoying are the results of his forethought and push." Deceased was very prominent in Eastern Masonic circles, and his kindly nature continually led him to seek opportunity for relieving the needs of the distressed. He was married in 1859 (his death occurred on the very anniversary of his wedding day), and from this union eight children were born—three daughters and five sons—the mother and children all survive the husband and father. The funeral services were held, on the afternoon of the 15th inst., in the Church of the Good Shepherd, Bishop Niles, assisted by the Rev. W. H. Moreland, performing the simple but ever beautiful burial ritual of the Episcopal faith. The church was filled to the doors with as representative an audience as it could be possible to bring together. It included a delegation from the gas works—the men would bid their last adieu to the master who had treated them so kindly—and a large delegation (at least 20 members) from the New England Association of Gas Engineers. Interment was made in the Amherst street cemetery.

It is hard to reconcile ourselves to the fact that Mr. Norton has yielded to the inevitable. Big, brave, calm and kindly, however, he was; and it is our comfort to say that, having known him intimately for a third of a century or more, in all that time his life was of the kind that commands in one stronger feelings of friendship and regard as the years advanced in number.

A Budget from Western "Observer."—Mr. H. B. Keller, Superintendent of works at Stroudsburg, Pa., died last week. He was recently connected with the Van Sickle Company, putting in a plant at Cadiz, O. He was Chief of the Fire Department of Stroudsburg for 20 years, and was much respected.——Mr. Marcus Smith, of Wilkes-Barre, Pa., is getting ready for the opposition Company by putting in a 2-inch main from his works to act as a feeder to the entire city. No scare about Marcus!——Supt. Maguire, of Honesdale, Pa., will rebuild his entire plant this season, except as to purifying house and boxes, which were new last season. He will erect a new relief holder, put in complete set for Lowe process, and generally overhaul.——The West Chester, Pa., people are making and selling a 20-candle power gas, produced by the Rose process, and are very much pleased with it.

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Hints to Gas Consumers on the Proper Use and Management of Gas.

By Wm. Paul Gerhard, C.E.

The following hints to householders, and to gas consumers generally, on the management, the proper application and the economical use of gas for lighting purposes, will prove to many interesting and useful. They are derived partly from personal, practical experience and observation, and partly gleaned and compiled from various sources.

Advice to Persons Building a House as to Size of Service Pipe and House Piping, Gas Meter, Gas Burners, Gas Fixtures, Gas Globes and Pressure Regulators, Supply to Gas Logs and Gas Stoves.

As soon as your house plans are ready, determine and locate on the floor plans the exact location of all outlets for both side and drop lights. Next ascertain the number of lights or burners in the house, and secure from the gas company a correspondingly ample size service pipe, never less than 1 inch in diameter. See that the gas service pipe is laid at a depth of 4 feet below the surface, and that it is not exposed by crossing open areas. Where it must unavoidably pass through these, the gas pipe should be well protected by some non-conducting covering to prevent the watery vapor in the pipes from congealing and freezing in winter.

The service pipe should be laid with a pitch towards the street main, or where this is impracticable, the service pipe should be graded towards the cellar, where a proper emptying pipe and cleanout plug should be provided. It is also desirable to have an outside gas shut-off cock or valve, located near the curb in the sidewalk.

The shut-off cock in the cellar near the gas meter should be a round-way cock, to insure a full supply of gas. Secure a gas meter of ample size, never less than of 5-light capacity, and for medium sized houses take a 10-light meter, and for larger houses at least a 20-light meter. Place the gas meter in a cool, well lighted, easily accessible place.

Make sure that the distribution pipes are properly and amply proportioned to the number of lights which they have to supply, and that the pipes are well run, well supported, free from traps or low places, and have a continuous pitch to the gas riser or the gas meter. *Do not allow the gasfitter under any circumstances to use any gasfitter's cement to tighten joints or to close up sand-holes.*

Be sure to have the whole gas piping rigidly inspected and tested under a heavy air pressure, before hanging the gas fixtures.

Purchase only properly constructed, tested gas fixtures, of first-class quality, with large supply tubes, and with proper heavy, tight-closing gas keys with strongly made pin stops. Make sure that when the fixture man hangs the fixtures, all fixture joints—that is, the places where the fixtures are secured to the gas outlets—are made absolutely tight.

Provide the very best quality burners, of large size, with lava or enamel tips. Buy only the best kind of shadowless wire prong holders, and enclose the flames with glass globes with bottom opening 4 or 5 inches in diameter, and of thin and clear glass.

On main supply pipe near the gas meter fit up a proper gas pressure regulator, or in large houses and in buildings of many stories, use on the side brackets and chandeliers volumetric governor burners.

Keep a plan showing the location of the meter and gas riser and the distribution of all gas pipes. Such a record will be useful for reference in case of future alterations, or in case of hidden leakages, especially in large buildings, and by its aid much unnecessary cutting up of walls and floors in the search for pipes may be avoided.

For all outside lights, on porches, verandas, and for places not readily heated in winter time, provide a separate supply with shut-off located inside of house, so as to enable you to shut these lights off in severe cold weather.

Keep bell wires away from gas pipes, particularly from lead or composition pipes. Cases are on record where such wires, in constant contact with a gas pipe during years of use, have acted like a saw in gradually cutting the pipe, finally causing a hidden leakage of gas, which to find and locate is often an extremely difficult matter. As a measure of precaution it is advisable to keep gas pipes away from steam, hot water or hot air pipes, also from electric light wires.

Should you build additions to your house, or should you add to the number of lights in your office building, or manufacturing establishment, make sure that your gas service pipe and riser, as originally put in, are ample in size to supply the additional lights. It is far better, in order not to impair the illumination of the original lights, to run a separate service pipe to supply the extension or addition. Also have the gas meter replaced by one of larger capacity.

If you introduce gas logs in fire places, or contemplate the use of gas heating stoves, or gas cooking ranges, always supply these from a separate service pipe starting at the house side of the meter between the same and the gas pressure regulator.

Maintenance of Gas Fittings.

Be sure to have the gas keys at your gas fixtures tightened by screwing them up when they become loose in time.

Under no circumstances tolerate gas keys without proper and secure pinstops.

If gas keys turn too hard have them properly greased from time to time so as to work easily and smoothly. A good key grease is made by melting together one part of beeswax and two or three parts of tallow, the mixture to be well strained after melting.

When a pin becomes defective or breaks have it replaced at once.

All types of gas burners should be examined from time to time, and kept clean and unobstructed. When a previously well shaped gas flame becomes ragged and uneven, the burner needs cleaning. In cleaning the slits of batwing and the holes of Argand and fishtail burners by means of the tools sold for this purpose, be careful not to injure the burners. For slit burners the cleaning is readily accomplished with a thin strip of brass with handle attached. For union jet burners, a small awl is made for the purpose.

Worn out burners should be removed from time to time, and it is well to make it a rule to replace all burners in constant use in a dwelling house with new ones about once a year, as gas burners, no matter how well made, will not last forever.

Cracked or split lava burner tips should at once be replaced to avoid any danger from fire.

Glass chimneys of argand burners, the globes or shades of all gas fixtures, and mica protectors and metal reflectors must be kept scrupulously clean and bright to avoid loss of light.

All low places or drips in a gas piping system should be cleaned and the accumulated water and naphthaline removed from time to time. Chandeliers must be inspected, and, if necessary, taken down and to pieces, and all stoppages in the tubing removed.

Management of Gas.

Householders are sometimes advised, as a matter of precaution, to keep the gas turned off during the night at the meter. It is much safer, in my judgment, to keep the gas permanently turned on at the main, during the day and night, while a dwelling house is occupied. In the first place, a gas light is frequently wanted during the night time, and it is an incidental advantage of buildings to which gas has been laid on, that a light may always be had whenever wanted, by simply turning a fixture tap and applying a match, without the necessity and the inconvenience of having to go down to the cellar to open the main stop cock. Second, and this is more important, escapes of gas and subsequent explosions may occur in dwelling houses where the practice prevails of turning off the gas at night at the main stop cock, before all burners are turned off. On turning open the stop cock at the meter the next morning, gas may escape at some burner left open the previous night, in considerable quantities, before the fact is discovered.

On the other hand, in unoccupied buildings, and in all buildings closed from Saturday until Monday, or on holidays—such as factories, workshops, stores, office buildings and other large establishments—the gas should always be turned off at the main after first shutting off all the burners.

In all large buildings the janitor, or the engineer or a foreman should have a proper supervision of the gas arrangements.

Never examine a gas meter with a candle light, owing to the danger of a gas explosion, unless you have ascertained beforehand that the meter itself and all its piping and connections are absolutely tight.

For the same reason it is well to be careful not to use near a gas meter tools or instruments causing flying sparks.

Never use the heat of a flame to thaw out a frozen wet gas meter. Use warm bags of sand or cloths dipped in hot water. Draw off some of the water and substitute alcohol or glycerine.

See that your gas service main from the street to the meter is protected against freezing wherever exposed, by felting or other non-conducting material. Otherwise it may happen in very cold weather that your gas flames will burn very badly or may go out altogether suddenly, owing to the freezing of the watery vapor in the pipe. If a service pipe in the street freezes, an excavation must be made and heat applied to the earth.

In lighting gas burners, gas lamps, gas stoves and gas logs, always apply the match or the taper simultaneously with the turning of the gas key or gas valve. If the cocks are turned on first, and the light applied after the lapse of more or less time, a puff of unburnt gas escapes, causing waste of gas and a bad smell, or in the case of gas logs and cooking stoves a small explosion, and sometimes more or less injury.

Never use candles to light gas, as the melting wax or tallow easily chokes up the holes or slits of the burner. Wax matches should always be avoided, and if wax tapers are used great care should be exercised. Better means of lighting gas flames are the electric and dynamic portable gas torches, or the electric gas burners.

In using portable or desk gas lights, connected with a fixed light or gas outlet by means of rubber tubing, always close the fixture key when turning out the light, before closing the key at the portable lamp, for otherwise the rubber tubing remaining full of gas after some use becomes saturated with gas and ill-smelling.

Never keep a gas flame turned down low in bedrooms. Many people are so sensitive to light that they cannot obtain perfect rest where even a dim light burns in a sleeping apartment. Again, it should be borne in mind that, owing to the resulting imperfect gas combustion, the air of the bedroom must necessarily become contaminated. Moreover, there is a possibility of the pressure in the street mains becoming reduced temporarily to such an extent as to extinguish the flame. When the pressure is afterward increased, illuminating gas would escape unburnt at the burner, exposing sleeping persons to the danger of being asphyxiated by gas. Finally, a flame turned down low is liable to be put out by a sudden puff or draught of air, the result being an escape of unburnt gas, causing possibly asphyxia or the death of persons occupying the room. Precautions in this respect are particularly necessary where water gas or a mixture of water gas and naphtha is supplied to consumers.

Ignorant people and persons unaccustomed to the use of gas often, on retiring, blow out the gas. In hotels and lodging houses this is a frequent cause of death from the inhalation of water or coal gas. A measure of safety consists in putting up appropriate signs over all gas flames of bed rooms, warning people of the danger. Hotel proprietors should exert constant watchfulness on all bedroom floors during the night. Some recently introduced safety devices or so-called "automatic" gas burners, which shut off the gas supply automatically as soon as the gas is blown out, offer a valuable remedy.

In the older hotels, and in many lodging houses, old-fashioned fixtures are often found which have no stops on the gas keys, and with these it frequently happens that the stopcock is turned too far in putting out the gas light. It also sometimes happens that the stop pin, not being durable, breaks. In both cases a dangerous escape of gas may follow.

Suggestions for the Treatment of Persons Overcome by the Inhalation of Gas.

In regard to the treatment of persons overcome with gas—either coal gas or water gas (the latter being far more dangerous)—either in the trenches when laying gas mains, or by escape of gas into bedrooms through leaky fixtures, or when the gas is "blown out," or from escape of gas into houses from breaks in street mains, the following are a few suggestions offered by prominent physicians.

Take the person at once into a place where the air is pure and cool. Don't crowd around him. Keep him on his back. Don't raise his head or turn him on his side. Loosen his clothing around the neck and remove all tight clothing. Give a little brandy and water (not more than four tablespoonfuls of brandy). Give the ammonia mixture—1 part of aromatic ammonia to 16 parts of water—in small quantities at short intervals (a teaspoonful every two or three minutes). Slap face and chest with the wet end of a towel. Apply warmth and friction if the body or limbs are cold. If the breathing is feeble or irregular, artificial respiration should be used, and kept up until there is no doubt that it can no longer be of use. Administer oxygen.

Another physician advises giving a tablespoonful of olive oil, or of common sweet oil, where a man is able to swallow. Then give him a little milk, or some brandy, whisky, or other stimulant on hand. Loosen his garments, place him in a half reclining position so he may breathe easily, create a circulation of air by fanning, or by placing him in a draught. Place a sponge with strong vinegar under his nose, wash the forehead with it, and the temples. Rub the body. Apply means for restoring respiration. When consciousness returns, wrap person in blankets and allow free perspiration, sleep and rest.

Accidents.

Gas leaks and escapes of illuminating gas may be the cause of accidents such as gas explosions or fire, besides the above-mentioned poisoning or asphyxia from gas inhalation.

Gas Leaks.

Gas leaks may arise either from defects in the street mains, the gas penetrating in many cases through the soil and foundation walls, particularly in winter time; or they may be caused by imperfections in the gas meter and its connections, or in the gas pressure regulator, or in the house pipe system, or, finally, they are due to bad fixtures, bad burners, or gas heating and cooking stoves.

In case a gas leak is discovered in a room, open at once the windows and the doors, in order to let the gas escape into the open air. Coal gas being lighter than air, the escaping gas will accumulate at the ceiling, and hence the upper sash should be let down. Under no circumstances use any light nor search for the leak with matches. The utmost care is to be observed in this respect, as the mixture of atmospheric air with illuminating gas in certain proportions, forms a very explosive compound, which, if brought in contact with a flame, will cause much injury and damage by gas explosion. If a burner is found to be accidentally left open, or only partly turned off, the key should be at once closed. If the escape of gas is due to a hidden leak, close the main gas cock, then locate the leak, and having found it, take at once and without delay the necessary steps to have it stopped and repaired.

Make it a rule never to allow anybody to sleep in a room in which the faintest odor of illuminating gas is perceptible.

Avoid lead or composition gas pipes which, in hidden places, are easily gnawed by rats, causing gas leaks, explosions or fire.

Precautions against Fire.

In order to guard against all danger from fire, see that all gas flames are at a safe distance from wood work or inflammable material.

Where ceilings are low, and where the distance from the gas light to the ceiling is less than three feet, provide metal or glass shields or bells as a protection, and have them hung so that they swing freely.

Enclose lights in positions exposed to drafts of air with glass globes. A draft of air may blow a gas jet as much as twelve inches sideways, and thus cause the scorching of woodwork or the blazing up of curtains, etc.

Avoid swinging gas brackets in dangerous positions, such as near doors, windows, blinds, curtains, portieres, or shelves. Rigid gas brackets are much safer and better.

Swinging bracket lights should be fitted with metal guard rings of large diameter to act as stop in preventing a gas jet from coming in contact with inflammable material.

In basements, cellars, in the servants' department of a house, particularly in the laundry, ironing room and in linen closets and wardrobes, protect the naked gas flames with securely fastened large, round metal wire cages, guards or screens.

Paper or cardboard reflectors on gas lamps should be avoided. It is better and safer to use only metallic reflectors.

Where ventilating or regenerative gas burners or "sunlights" are used, care should be taken to have the ventilating flues well constructed of metal and free from contact with woodwork.

Set the gas meter in a well ventilated place, having, if possible, communication with the outside air.

Gas jets often blaze up from a temporary excess of pressure or from a lava tip cracking or jarring off, where a heavy weight is dropped on the floor overhead.

In lighting the gas fixtures care should be observed in the use of matches. Parlor and wax matches are dangerous, and the use of "safety" matches, lighting by friction on specially prepared surfaces only, is recommended.

Provide metal or earthen boxes for the common kind of matches, and have also a second receptacle to receive the burnt matches. Matches, tapers or fuses should not be thrown on the floor unextinguished. The common phosphorus matches are hard to extinguish, and the practice of smokers of carelessly throwing them upon the floor unextinguished is exceedingly reprehensible.

Keep matches out of reach of mice and rats, and do not leave them where they are exposed to the rays of the sun. Full boxes of matches are sometimes ignited by friction by the sliding motion of the boxes, in opening or shutting.

In large establishments the general lighting up should be made the duty of a special employee. He should either use a wax taper, or, better, portable electric torches. Alcohol torches are dangerous.

The "matchless" burners may be used in halls, toilet rooms, etc., and at these places one may thus dispense with the use of matches.

Irregularities in the Gas Supply.

When householders experience trouble with the burning of gas lights, the irregularities may, in general, be looked for as being due to one or several of the following causes, viz.:

(1) To defects in the gas fixtures and gas burners.

(2) To defects in the house pipes between the gas meter and the gas burners.

(3) To defects in the gas meter, particularly where wet gas meters are used.

(4) To defects in the service pipe, between the street gas main and the meter.

(5) To defects in the system of street mains.

(6) To defects or troubles at the gas works.

When the gas lights of neighboring houses, or of houses in the same street, show more or less the same troubles as those you experience in your house, the cause may with certainty be attributed to either (5) or (6), or to both.

If the trouble does not exist in adjoining houses, but is confined to your own house, you may be sure that it can only be due to one or more of the causes, (1), (2), (3) or (4). In that case inquire and examine into the four points named to find out if one or more of these are the cause. In doing this remember that if all gas flames in your house are equally affected, the trouble must be due to causes (2), (3) or (4), and it will in most cases be found to be due to defect (2), usually in the house pipes between the gas meter and the first branch, or to irregularities in the meter, (3).

The following detailed explanations will be helpful in remedying the defects.

(a) If a once satisfactory gas flame is found to be burning with inferior light, the cause is either an obstruction in the burner, or else accumulation of rust at the foot of vertical gas pipes, or the service pipes are partially choked with tar or naphthaline, or condensed watery vapor. When the gas flame is "ragged" the burner tip is partially stopped up, and the burner should be cleaned, or a new burner should be substituted. If this does not remedy the trouble, rust accumulations may be the cause. Remove these by blowing out the service pipe by means of a service force pump. If condensed gas vapor or naphthaline obstructs the pipes, remove same at the drips or siphons. The meter, if a wet one, may have too little or too much water, or in winter time, the water collected in syphons or in the meter, may be frozen, and the pipes or the meter need thawing out.

(b) If a gas flame goes out suddenly, this will be found to be due either to air in the pipes, or it may be due to accumulations of condensed vapor in the house pipes. Remove the same by opening the main drip or plug of the service main, near the gas meter, and when doing so be sure not to have any light anywhere near you.

Where a wet meter is used, and the gas goes out suddenly at all the fixtures lighted, it may be caused by a deficiency of water in the meter, or else by an excess of water. In winter time it may be due to the freezing of the gas meter, or of the service pipe from the street to the house.

Where the lights in several houses go out suddenly, the trouble is either in the street mains or at the gas works.

(c) If a certain number of gas lights are burning, and upon lighting several more either on the same or on other floors, the former flames are unfavorably affected; that is, if they show a reduction in size or in brilliancy, it may be taken as an indication that the house pipe system has pipes of insufficient caliber to supply all the lights. This trouble can only be remedied by repiping the house with larger gas pipes.

(d) If gas, upon being ignited at a burner, burns with a bluish flame, this is a sure indication that there is air in the house pipes. This is liable to happen where it is made a rule—although it is a bad practice—to shut off the main gas cock over night. Air then fills the pipes through leaky joints in the pipe system, and upon again turning on the gas, air is driven out at the burners. The remedy is to search for the leaks and to make the piping and the gas fixtures absolutely tight.

(e) If one or more gas lights bob up and down or flicker, it is an indication that water has accumulated in the branch pipes supplying these lights. If all lights flicker the trouble may be looked for in the main house service pipe. This water should be removed, either at the fixture keys, or else at low places where "siphons" are provided in the distribution system.

Where a wet meter is used, this bobbing up or down is sometimes caused by there being either too much or too little water in the gas meter.

Where the gas lights, as sometimes happen, flicker in several adjoining houses, the cause is, obviously, not to be looked for in the house service, but in the street mains, and in such a case the gas company should be notified.

(f) It sometimes happens that the gas consumer cannot get sufficient pressure to supply his burners, and an insufficient illumination is the result. The trouble is usually, by laymen, attributed to the poor quality of the gas, whereas the real source of the difficulty will, in most cases, be found in

(1) Insufficient pressure at the gas works, or

(2) Too small or obstructed gas mains in the street, or in siphons in street mains which have become filled with water; but, if confined to a single house, the trouble is due to

(1) Insufficient or obstructed house service pipes.

(2) To gas meters of insufficient size or capacity, or to obstruction in the meter.

(3) To insufficient capacity or obstruction of the house pipes.

(4) To obstructions in the tubing or keys of gas fixtures.

(5) To defective, obstructed or insufficiently large burners.

Sometimes the trouble is due to the use of bad pressure regulators, or to the use of pressure regulators in districts where the gas pressure is poor.

(g) The roaring or hissing sound of a gas jet indicates that the trouble lies in the opposite direction, viz.: That there is too much pressure in the house pipes or at the burners, and that the consumer is paying for gas wasted.

The best results in gas illumination are always obtained when gas issues at the orifices of the burners with a slow velocity, through large burner slits or holes. This pressure of illuminating gas is measured in tenths of inches of a column of water, and the rule is that the pressure at the gas meter should not exceed $\frac{6}{10}$ or $\frac{7}{10}$ of an inch; the loss in passing through the meter amounts to $\frac{1}{10}$ to $\frac{2}{10}$ inches, the loss through friction in the pipes, if these are properly adjusted in calibre, $\frac{1}{10}$ of an inch, leaving a pressure of gas at the burners of $\frac{4}{10}$ to $\frac{5}{10}$ of an inch.

Consumption of Gas; Control and Reduction of Gas Bills.

Assuming the average burner consumption to be 5 cubic feet per hour, the cost of a single gas light per hour, taking gas at its present price in N. Y. City and Brooklyn, viz., $1.25 per 1,000 cubic feet, would be

$$\frac{5 \times 125}{1{,}000} = 0.625 \text{ cents.}$$

Assuming the average number of hours per year for each gas flame to be 1,500, which corresponds to the time from sunset until ten o'clock each night, we have

$$1{,}500 \times .625 = \$9.37\tfrac{1}{2} \text{ cents}$$

as the average yearly cost of each gas flame.

When the gas flames are kept burning on the average from sunset until midnight, the average annual number of hours is 2,250, and therefore

$$2{,}250 \times .625 = \$14.06\tfrac{1}{4} \text{ cents}$$

as the yearly cost of each burner.

For gas jets burning constantly, day and night, such as are used in connection with ventilating gas jet burners in vent flues of water closets or toilet rooms, the annual cost of a gas flame would be approximately

$$\frac{24 \times 5 \times 1.25}{1{,}000} \times 365 = \$54.75$$

If the burner consumes 3 and 4 instead of 5 cubic feet per hour, the cost would be reduced to $32.85 and $43.80 respectively.

The following useful table, compiled by a German gas engineer, gives the hours of burning gas at different seasons of the year, for a latitude of Dresden:

TABLE I.—*Showing Number of Hours during which Gas is Burnt.*

Months.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Per Year.
From sunset till 10 P.M.	186	140	139½	105	77½	60	62	93	120	155	180	201½	1,520
" " " 11 P.M.	217	168	170½	135	108½	90	93	124	150	186	210	232½	1,885
" " " 12 P.M.	248	196	201½	165	139½	120	124	155	180	217	240	263½	2,250
" 12 P.M to sunrise.....	248	210	201½	165	139½	120	124	155	165	201½	225	248	2,200

TABLE II.

Total Consumption in Cu. Ft. per Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1,000.....	111	92	88	71	61	52	56	68	80	95	106	117
8,827.....	1,000	814	773	630	541	460	491	600	700	836	936	1,033
10,833.....	1,227	1,000	950	772	664	566	606	737	860	1,030	1,150	1,268
11,410.....	1,292	1,053	1,000	814	700	595	638	776	904	1,082	1,210	1,335
14,020.....	1,588	1,294	1,228	1,000	860	735	784	954	1,111	1,330	1,487	1,640
16,315.....	1,848	1,506	1,430	1,164	1,000	851	912	1,140	1,292	1,547	1,729	1,909
19,152.....	2,170	1,770	1,678	1,367	1,174	1,000	1,061	1,303	1,518	1,812	2,030	2,241
17,875.....	2,025	1,650	1,566	1,275	1,096	933	1,000	1,217	1,425	1,700	1,900	2,090
14,692.....	1,664	1,356	1,287	1,048	909	767	822	1,000	1,164	1,400	1,558	1,719
12,618.....	1,430	1,164	1,106	900	774	660	760	860	1,000	1,200	1,338	1,477
10,540.....	1,195	973	924	751	644	550	592	717	835	1,000	1,118	1,233
9,429.....	1,068	870	826	672	578	492	527	642	747	895	1,000	1,103
8,546.....	968	789	749	609	524	446	478	581	677	810	963	1,000

The consumer should regulate and reduce any excessive pressure. This may to some extent be accomplished either by partly closing the main stop cock at the gas meter, or by partial turning off and adjusting carefully the taps at each burner. Both methods are imperfect as far as the regulation of the pressure is concerned, because the pressure continually varies. The better remedy consists in the use of either pressure regulators, attached to the main service pipe at the house side of the meter which regulates the pressure automatically, or, in the use of check burners, either governor or volumetric burners.

(h) If a dwelling adjoins a theater, hall of amusement, or a large store or manufacturing establishment, where a great number of lights are kept burning, the gas jets will often jump up suddenly owing to an increase in the gas pressure caused by the sudden turning off of a large number of lights when the above establishments are closed.

For all dwellings so located, a gas governor attached to the house pipe near the gas meter, or on every floor, will be of much usefulness.

(i) The smoking up of walls and ceilings can be avoided by the use of improved burners. It can also be remedied by the use of mica smoke catchers attached to the top of globes, or of chimneys of Argand burners, or by smoke bells or shields of glass or metal, hung 12 to 18 inches above the gas jets.

The daily, weekly, monthly and yearly gas consumption may also be approximately calculated by recording the number of gas lights in the occupied rooms of a house and the respective hours during which they are kept burning each evening. Of course, it is necessary to know the consumption of gas at the various gas burners, and where volumetric gas burners are in use, this is an easy matter. With these data on hand, the monthly gas bill can be checked very nicely within certain limits. See example:

Month of Year.	Name of Room.	Number of Burners Lighted.	Consumption of each Burner.	Number of hours for each Burner.	Gas consumed per day.
June	Kitchen.....1		3½	2	7 cub. ft.
	Dining room....2		5	1½	15 "
	Library.....3		4	3	36 "
	Hall.....1		4	2	6 "
	Bedroom No. 1..1		4	1	4 "
	" No. 2..1		4	1	4 "
	" No. 3..1		4	1	4 "
	Bath room.....1		4	½	2 "
				Per night.....78 cub ft.	

Or 30 × 78 = 2,340 cubic feet, at $1.25 = $2.93, as the monthly gas bill.

It is recommended to gas consumers to keep a small book in which the gas consumption and the gas bills are regularly entered from month to month. A simple schedule for such a book is the following:

Date.	Reading of Meter.	Gas consumption in cubic feet.	Price per 1,000 feet.	Amount of gas bill.
January 1st.....	8 7 6 0	3 7 8 0	$1.25	$4.73
January 31st.....	1 2 5 4 0	2 4 3 0	"	3.04
February 28th.....	1 4 9 7 0	2 0 2 0	"	2.53
March 31st.....	1 6 9 9 0			

Again, the consumption of the corresponding months of successive years may be compared in a summary like the following:

Month of Year.	1889.	1890.	1891.	1892.	Etc.
	Cubic Feet.	Cubic Feet.	Cubic Feet.	Cubic Feet.	Cubic Feet.
January.....	.....	.....	.....	.....	.....
February.....	.....	.....	.....	.....	.....
March.....	.....	.....	.....	.....	.....
April, etc.....	.....	.....	.....	.....	.....

Table II. (see p. 113) is also useful in comparing the proportionate consumption of gas during the different months of one year. In this table it is assumed that the same number of gas lights is kept burning regularly in a house during successive months, the number of hours per month varying as per Table I.

The use of Table II. will be readily understood from the following example: During the month of June the consumption of gas in a dwelling amounted to 2,700 cubic feet of gas; what will the consumption in the same house be in December, if the same number of burners are in use? Answer: The consumption in December would be—

$$2{,}700 \times \frac{2{,}241}{1{,}000} = 6{,}050 \text{ cubic feet.}$$

Or, if the consumption of gas for the month of September is equal to 3,000 cubic feet, what would be the annual consumption? Answer:

$$3{,}000 \times \frac{12{,}618}{1{,}000} = 37{,}854 \text{ cubic feet.}$$

In large establishments it is suggested to keep a *daily* record of the gas meter readings. This will not only enable one to detect wasteful use of gas and leakages, but it will also show whether the meter continues to work properly.

A foreman should be entrusted with this matter and with the keeping of a monthly gas consumption account book. This man should also have charge of the gas meter or meters, of the gas pressure regulator, and of the burners. It should also be his duty to attend to the periodical cleaning of the burners, shades, chimneys and globes, and he should renew defective and worn out burners, or broken, cracked or split lava tips.

How to Reduce High Gas Bills.

In order to reduce high gas bills the householder should follow all the hints given above. He should above all make sure that his gas pipes and gas fixtures are absolutely tight and that there is no leakage and waste of gas anywhere on his premises. He should endeavor to obtain a maximum amount of illumination with a minimum gas consumption by using only the best kind of gas burners and the most improved forms of glass globes, with shadowless holders. He should, moreover, use either pressure regulators or governor burners, in case of excessive gas pressure. Finally, he should read the index of his gas meter frequently to make sure that there is no wasteful use of gas by children or servants, and also to control approximately the gas consumption.

How to Detect Gas Leaks or Escapes of Gas.

There is a very simple and effective method by which every consumer may readily and with very little trouble ascertain whether there is any escape of gas on his premises. Make sure that no burner keys are open, and with the main stop cock at the meter open, notice carefully for some length of time the position of the index hand on the small upper dial of the meter index. If it moves, it is a sure indication that there is a gas escape or a leak somewhere. By noting the time required for the index hand to travel once around the small dial, the actual quantity of gas escaping, in other words, the extent of the leak, may be ascertained with accuracy.

It is equally feasible to detect an escape of gas by the sense of hearing. Place your ear on the meter casing, and if you notice a rumbling sound, it is a sign that gas is passing through the meter and that there is a leak somewhere.

How to Ascertain the Quantity of Gas Consumed.

The small dial is also useful for ascertaining, with a reasonable degree of accuracy, the consumption of gas from one or more burners in various parts of a house. Note the exact number of burners lighted, make sure that no others are put in use during the test, and note either the number of cubic feet consumed during a measured period of time, say a quarter of an hour, or an hour, or else see how much time in minutes it requires for the small index hand to travel from one cubic foot mark to the next full foot. From these data the actual consumption is readily ascertained by a simple calculation.

Some Analyses and Lighting Values of English Coal Gas Made During the Year 1891.

[A paper read by Mr. Wm. A. Foster, M.A., before the Incorporated Gas Institute.]

Through the courtesy of several gas engineers, I have been enabled, during 1891, to take samples of coal gas manufactured by them in different parts of England. The lighting value of each of the samples taken was determined at the time by a trained, experienced, and distinct operator. The conditions under which the samples were taken were also precisely similar. An open-bar photometer of the same length was employed; the burner was the standard Board of Trade Argand; the standard of light was sperm candles, used in each case in the same way. The only exception is a sample of gas taken from the supply to my own laboratory. This was tested in an open-bar photometer by means of a Methven screen, instead of sperm candles. All the lighting values, expressed in sperm candles, have been corrected for deviations of the gas from standard conditions of temperature and pressure.

The methods of analysis adopted have been, in all essential particulars, those used and described by Dr. Percy Frankland, in his paper read before the Chemical Society in 1884. Herewith are appended tables of the results obtained. In addition to an account of the proximate constituents of the samples, I have furnished a statement of the average molecular composition of the heavy hydro-carbons—the hydrocarbons removable by the action of fuming sulphuric acid. There is also a statement of the volume of oxygen needed for the complete combustion of a given volume of each gas; and the volume of carbonic anhydride resulting from such combustion. Four of the seven samples which are the subject of this communication contain sensible quantities of nitrogen; and it is to certain considerations arising from the presence of this nitrogen that I desire to direct attention.

Dr. Frankland and others have shown that, within the limits reached by the figures of my experiments, nitrogen, in a mixture of coal gas and nitrogen, reduces the lighting value of the coal gas in simple proportion to its volume in the mixture. On this basis, I have calculated what the lighting value, the amount of oxygen consumed, and the carbonic anhydride produced, would be were the gas freed of its nitrogen. The numerical results are given in Table II. On expressing the same figures diagrammatically, where lighting values are represented by abscissæ, and percentages of oxygen and carbonic anhydride by ordinates, the curves obtained are characteristic. It will at once be seen that, for a given lighting value, more carbon vapor is needed in cases where nitrogen was originally present than when absent. Irrespective of the condition in which the carbon exists in the gas, the presence of the nitrogen is associated with a lower specific illuminating value per unit of carbon. From an inspection of the figures of the analyses, I am unable to account for this reduction in the lighting value of the carbon.

The experiments which have been made by other workers on the reduction in lighting value of coal gas when diluted with nitrogen have been made with purified gas; and, therefore, any reasoning based on such experiments can only be applied in a qualified way when considering the effects of nitrogen introduced as atmospheric air during the process of manufacture or purification. For my present purpose, the introduction of air may be considered under four heads—

1. As air drawn into the retort through undue exhaust.
2. As air intentionally introduced while the crude gas is hot, and containing hydrocarbon and tarry vapors.
3. As air introduced after cooling and scrubbing, but prior to purification proper.
4. An air accidentally introduced during the change of purifying material.

The samples are practically free from oxygen; and, therefore, no air has been accidentally introduced (4). Air is not used for purification in the works whence these samples came. Hence origin under heads (2) and (3) can be neglected. I therefore infer that air has been drawn into the retort,

Table I.

Reference Number of Sample.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.
Carbonic-acid gas.....	....	0.47	0.32	0.53	....	....	....
Carbonic oxide.....	7.00	6.58	7.58	7.40	6.01	6.51	5.60
Heavy hydrocarbons ($C_n H_m$).....	4.35	5.84	4.62	5.93	5.69	6.33	7.88
Marsh gas.....	35.12	35.93	36.33	33.32	37.80	37.66	37.74
Hydrogen.....	50.18	41.11	43.65	38.38	40.06	49.10	46.55
Oxygen.....	0.61	0.36	0.40	0.57	0.44	....	....
Nitrogen.....	2.52	9.71	7.10	13.89	10.50	0.40	4.00
	99.78	100.00	100.00	100.02	100.50	100.00	101.77
Carbon density of heavy hydrocarbons.....	3.20	3.00	2.53	2.80	3.26	3.14	2.57
Hydrogen density of heavy hydro-carbons..	5.80	5.40	6.80	6.10	4.40	5.38	4.30
Oxygen needed for complete combustion of 100 volumes original gas..	122.32	122.35	120.05	120.19	124.60	132.10	131.90
Carbonic acid produced by combustion of 100 volumes original gas..	56.88	59.82	56.35	58.50	61.60	63.92	64.38
Lighting value per 5 cubic feet per hour in standard sperm candles	16.30	16.60	16.80	16.84	18.50	19.10	20.00

Table II.

The following figures have been obtained by calculation from the foregoing. They furnish the carbonic anhydride, oxygen, and lighting value, on the assumption that no nitrogen is present in the individual sample:

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.
Oxygen needed for 100 volumes of nitrogen-free gas.....	125.98	134.48	129.41	139.42	139.55	132.60	136.12
Carbonic acid produced by 100 volumes of nitrogen-free gas.....	58.58	65.80	60.51	67.86	69.00	64.20	66.44
Lighting value per 5 cubic feet per hour in standard sperm candles of nitrogen-free gas.....	16.80	18.26	18.05	19.53	20.72	19.20	20.68

For some time I have maintained, on general considerations, that the influence of nitrogen on the lighting value of coal gas would most probably vary with the point at which air is introduced in the manufacture—say, in the four supposed cases already given. I was prepared to find an increase in the amount of carbonic oxide when air enters the retort; but that is certainly not shown in these analyses, even when allowance is made for the diluting effect of a given volume of nitrogen. I ought, perhaps, to point out that the quantities of carbonic oxide in all the samples is considerably greater than those given in several recently published analyses of coal gas.

Several attempts have been made to assess the lighting value of combustible gas by chemical and physical processes, apart from the use of a photometer. The specific gravity of the gas is a rough guide to the lighting value, if one knows the way in which the sample has been manufactured and purified. The diminution in volume caused by the action of bromine furnishes useful information. The determination of the volume and character of the heavy hydrocarbons is a third method; but, for strict'y accurate purposes, all such methods are subordinate to that of the direct measurement of the light by a photometer. However, they have their uses.

An inspection of the diagram showing the relation between lighting value, oxygen consumed, and carbonic anhydride produced, will, I venture to think, lead to the conviction that a knowledge of the two latter factors, in the case of an analysis of illuminating gas, will enable one to assess the lighting value more accurately than any of the chemical or physical processes previously referred to—that is, when the lighting value comes within reasonable limits. Further data are, of course, necessary.

I draw the following inferences from these experiments:

1. That the ingress of air at the retort in gas manufacture lowers the specific lighting value of the carbon.

2. That a consideration of the quantity of oxygen consumed, and the quantity of carbonic anhydride produced, by an ordinary sample of coal gas, is a valuable guide to its approximate lighting value.

3. That the quantity of carbonic oxide in these samples is much in excess of that attributed to similar gas by recent workers.

Addendum.—Since the foregoing paper was written, I have had occasion to employ coal gas for quantative heat experiments where means for testing its lighting value were not available. A sample taken from bulk in a test holder gave, on analysis, the following data:

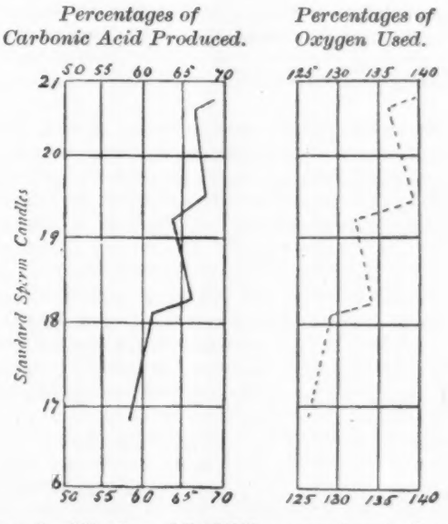
Carbonic anhydride.....	=	56.70 per cent.
Oxygen consumed	=	120.00 "
Nitrogen in the original gas	=	2.38 "

I put the lighting value about 16.3 candles. The official testing place was closed on the occasion of my experiments; but the engineer of the works supplying the district informs me that tests made by the company's officials on that occasion went up to 16.5 candles.

It will be in the recollection of some of my hearers that in the autumn of 1889 I made an examination, both chemically and photometrically, of coal gas manufactured by the Dinsmore process at Widnes. Some of the points brought out in that inquiry were certainly novel. The lighting values were determined by the Sugg "G" Argand—not the London Argand, such as has been used in the experiments described herewith. Fortunately the chemical analyses were made with all the care and experience I could command; and I can refer to them with confidence. There were three samples, two being so-called Dinsmore gas, and the third a mixture of ordinary and Dinsmore gas. The data obtained were as follows:

Description of Gas.	Percentage of Carbonic Acid Produced.	Percentage of Oxygen Used.	Percentage of Nitrogen in Original Gas.	Lighting Value in Candles by the "G" Argand.
Dinsmore I.....	63.12	130.6	0.60	21.8
" II.....	68.44	136.5	0.59	22.3
Mixture (town gas)...	58.70	120.3	1.10	18.6

According to the diagram the lighting values of these gases with the London Argand would be about as follows: No. I., 19 candles; No. II., 21 candles; town gas, 16.8 candles.



At the time of publication of the Widnes experiments, the extraordinary low specific gravity of the Dinsmore gas was a matter of public comment. I then called attention to possibilities in the *quality* of the carbon molecules affecting the result. Last year I gave the Institute an account of experiments connected with this part of the subject. I am now enabled to put before the Institute evidence of a different order—namely, that there was in the gas the quantity of carbon vapor necessary to constitute a gas of high lighting value—higher, in fact, than can be explained by the previously accepted data based on a mere consideration of the specific gravity.

Disputes between gas companies and their supervising authorities on the subject of the lighting value of the gas of the district are not unknown. There was some evidence recently given before a parliamentary committee on the lighting value of the gas supply of a well known borough. The variations in the lighting value were alleged to amount to several candles—say, from 14 to 18. My contention is that such alleged variations cannot occur without a chemical analysis, on the lines indicated in this paper, disclosing the real character of the gas supplied and its approximate lighting value. Tests of gas supplied on a particular date cannot be verified; but samples of gas used at the time can

always be reserved in sealed glass tubes, and the character of the gas subsequently ascertained. Much misunderstanding would, I venture to think, be avoided by such a course of procedure. In any case, my proposition makes it possible for an independent observer to revise the autocratic dictum of a gas examiner, by fresh experiment; and, in these days of constitutional government, that is worth something.

The Practical Management of an Arc Light Installation.

A writer in *The Engineer* says that during the last few years electric lighting has made such rapid strides that many young men are rushing into the profession and preparing to take charge of electrical plant as positions offer themselves. It should, however, be borne in mind that there will be many cases where advantage will not be taken of the services of professional electricians. They will be chiefly engaged in the workshops of the manufacturers, and also to take charge of new electrical plant where the buildings and the engines and boilers have been specially designed for such plant; but there are other cases where railway companies and other large corporations desiring to use the electric light make use of existing buildings where they already have machinery for different purposes at work, and where there is plenty of steam available without putting down new boilers. In many such cases it would be an unnecessary expense to employ a professional electrician, and so the installation is usually placed in charge of the foreman who has charge of the other machinery. He may be a first-class mechanic, but it will often be found that he has had no training with electric machinery, and he will look upon his new charge with considerable misgiving as to his own abilities, and, moreover, through his want of knowledge of the practical details and little ailments of the machinery, he will for some time after its installation cause himself far more trouble than necessary in finding out certain faults, and very probably do some injury to the plant. There are at the present time many such men called upon to take charge where the bulk of the machinery is of a type with which they are quite conversant, but they are sorely troubled to find that an electric plant is tacked on, and as it is specially difficult for a mechanic suddenly to find himself in charge of such a plant, the result of practical experience of some of the defects met with in actual practise, can scarcely fail to be useful to some of our readers.

Many of the existing installations have been at work for 10 or even more years. It may be argued that dynamos which have been working 10 years are worn out, and should be replaced with modern machines; but this need not necessarily be true, and there are many firms who will not go to the expense of renewing their plant as long as it does the necessary work with a fair degree of satisfaction. There are dynamos and lamps still at work which were manufactured by some of the original firms, and which are still doing excellent duty, although they may not be giving quite such good results as the most modern machines. Anyone who will look carefully at an old armature, for instance, will be struck with the greal amount of care which has been bestowed on the winding. They are most carefully wound. The methods of winding were slower than now, and the makers had not the same experience as to the amount of insulation required between the section, so they made sure by putting on plenty, and they also left a large margin in the gauge of wire to carry the necessary current. Many of the older armatures still in use have a movable commutator bars, and the ends of the armature sections are screwed down direct on to the bars; but owing to there being no lug or projection at the end of each bar, as in the newer machines, the copper dust from the brushes gets down behind the commutator, so that this class of commutator requires frequent cleaning. To do this the two wires on each bar should be tied together and numbered, and each bar should also be numbered as it is taken off. The advantage of this numbering is that every bar will go back in its original position on the commutator. Supposing these bars have been at work, say, a month, they will be somewhat worn, and if they are not put back in precisely the same place, there will be some projecting above the others, which will cause the brush to jump, and so cause sparking and heating. Each bar should be carefully cleaned as it is taken off, and the number marked on the under side, so as not to cause any roughness on the top side. Then when all the bars are off, and the ends of the sections tied and numbered, the commutator should be taken bodily off the spindle, when it will be found that a certain amount of copper dust and dirt has accumulated at the back of the commutator, which was hidden by the armature wires.

Great harm may be done to the armature by not taking off and cleaning the back of the commutator regularly, because the copper dust, etc., accumulates until it forms a bridge across from one section to another, and so causes short circuiting in the armature coils, and consequent heating, which is often erroneously put down to other causes. The brushes also require the greatest care. Whether these are made of copper strips or wires, the layers which are actually touching the commutator are liable to wear the quickest, and if they are not watched and regularly trimmed, these strips become shorter than the others, so that whilst one part of the brush is bearing properly upon the commutator, these straggling strips will be just tipping the bars edge on. As each successive bar of the commutator passes these strips it causes them to vibrate, so that they are constantly making and breaking contact with the commutator. This, of course, causes sparking and heating, and consequent loss of energy. The pressure of the brushes on the commutator should be nicely adjusted, so that there is just sufficient to reduce the sparking to a minimum, as any extra pressure means unnecessary friction and consequent wear of brushes and commutator bars, which again means that an unnecessary amount of copper dust will be scattered over the machine. The commutator bars should not be allowed to wear too thin, or they will not have sufficient capacity to convey the necessary current, and, moreover, when very thin, they bend a little each time they pass the brush, and so cause sparking.

Another cause of heating in old armatures is because the bearings at each end of the spindle are usually smaller than those of the most improved types, and if they run hot, of course the armatures will get hot also, and care must be taken not to pour on too much oil, as it is liable to splash over the end coils and cause the insulation to become rotten. It will be noticed that nearly all the defects in the armature occur at each end—excepting, of course, where a coil is burned out bodily. This is chiefly because the ends are more exposed to oil, dirt, etc., but one cause is a very bad practice of taking hold of the armature to turn it round when cleaning. This constant friction with the fingers rubs through the insulating material. The armature should always be turned by taking hold of the pulley. In the most modern machines the commutator bars are not movable, and the ends of the sections are soldered on to a lug which projects from each bar, but the details referring to the brushes and general cleanliness refer to any type of machine. In all cases it is a good plan to use a pair of ordinary bellows every morning to blow out any loose matter which may have accumulated behind the commutator, and also to keep a clear space between the armature and field magnets so as to allow of a free passage of air for ventilation.

We have now stated some of the defects originating in the dynamo itself; but it is often the case that an armature is caused to run hot through some defect in the external circuit. Any connection, however slight, between the positive and negative wires will offer a circuit to the current which under ordinary circumstances will be of much less resistance than the circuit through the lamps. This will cause a large increase in the current generated, and if it is larger than the safe current allowed for the armature wires, will cause them to get hot; and if allowed to go on long enough the armature will be ruined. Other causes of heating are defects in the lamps. It is very often the case when heating takes place, that the lamps are the primary cause. Although the details vary very much in the mechanism of the many different types of arc lamps, the general principle is that the arc is formed by sending the whole or a portion of the current through a coil of wire—or solenoid, as it is called—situated inside the lamp. Inside this coil is an iron core which is free to move, and which is usually connected to the positive carbon holder, so that when the core moves up or down, the carbon holder, and consequently the carbon, moves also.

Supposing the points of the two carbons are together, so as to complete the circuit, immediately the current passes through the coil it causes the iron core to move in such a direction that the carbons are parted; and if the electro-motive force of the dynamo is sufficient to drive the current across the space between the carbons, the necessary arc will be established. If only one arc lamp is at work, a dynamo with a low electro-motive force will be used; but if a number of lamps are lighted in series—viz., the same current driven through the whole of the lamps—then the electro-motive force must be proportionately increased, because of the increased resistance in the circuit. If everything is in good order and the arc established, the carbons will, of course, begin to consume, and after a short time the arc—viz., the space between the carbons—will become slightly longer. As this is equal to placing a resistance in the circuit, the current will consequently be reduced. This reduced current, traversing the coil in the lamp, will have less power on the iron core, which consequently falls a little, bringing the positive carbon down with it, until the arc is again of such a length

that the current passing through the coil is sufficient to hold the core stationary. As the movement of the iron core is limited, various ingenious arrangements have been devised to cause the carbons to feed, and so keep the length of the arc constant until the whole length of the carbon has been consumed.

Some makers fix inside the lamp a clockwork arrangement, which is geared up to one or both carbon holders, and the iron core previously referred to is coupled up to a pawl or brake lever, so that when the arc lengthens sufficiently to reduce the current, the action of the iron core lowering releases the break and allows the clockwork to come into action, whilst others use friction wheels and clutches which are automatically put in and out of gear by the action of the current.

In all these arrangements the primary object is to keep the carbons feeding gradually at the same speed as they are consumed, because the more regular and gradual the feed, the more constant will be the length of the arc, and consequently the steadier will be the light. On the other hand, if this feeding is not regular, the light will be constantly flickering. The flickering or jumping may be caused by the lamp not being nicely adjusted. The adjustment of the length of the arc is an important point. When a lamp has been in for repairs or cleaning, it will frequently require adjustment. For this purpose one end of a spiral spring is usually attached to the top of the iron core working in the solenoid, and the other end is connected to a screw. Now, supposing the lamps usually work with an arc ½ inch long, but on starting the repaired lamp the arc is, say, only ¼ inch long, then the current must be assisted by turning the screw so as to elongate the spring and so cause it to pull up the positive carbon holder until the arc is the proper length. If, on the other hand, the arc is too long, the pull on the spring should be released a little.

By carefully watching the working of the lamp with this spring at different tensions, the operator will soon learn the proper adjustment. A lamp will be caused to work unsteadily if the current is assisted too much. Suppose, for instance, a lamp is perfectly adjusted so that the spring is assisting the current traversing the solenoid, to keep the carbons the proper distance apart. Now, if the screw be turned so that the spring assists the current a little more, any slight increase in the current will cause the light to go out, because the excessive pull of the spring and the slight increase of current traversing the solenoid combined, suddenly raises the carbon until the arc is so long that the electromotive force of the dynamo is not sufficient to drive any current across, and the circuit is suddenly broken through that lamp. The iron core, therefore, falls, and causes the carbon points to come together again, and the circuit being completed the rush of current through the solenoid again lifts the iron core and strikes the arc, but owing to the excessive pull of the spring the carbons will probably be parted with a run, as it were, and so again exceed the limit and break the circuit. If this lamp is not readjusted the jumping will continue, and may cause delicate parts of the lamp to be injured. As a rule it is best to adjust a lamp slightly heavy, viz., after screwing up the spring so that it assists the current to lift the core the required height, the spring should be eased a little, thus putting a little more weight on the core, so that it will not be quite so sensitive to a slight increase in the current. Any lamp which feeds by gravity, viz., by releasing the rod carrying the positive carbon and allowing it to gradually fall by its own weight, also requires adjusting according to the size and, therefore, the weight of the carbon, for it will be seen that with a constant current traversing the solenoid the current will not be able to lift the core so high when it is coupled up to a full length of carbon, as it will when the current is nearly consumed; and, therefore, as the carbon consumes, the spring must be slightly released or the arc will become unsteady. Where very small carbons are used this, of course, is not so important; but a long, thick carbon makes a very considerable difference in the weight attached to the core.

As with the dynamos so with the lamps, they must be kept clean and all the necessary parts free to move. As a rule, one part of the frame of the lamp is used to conduct the current to the positive carbon, whilst the other part conducts the current from the negative carbon, so that these two portions of the lamp must be kept well insulated. If any carbon dust or other conducting substance is allowed to accumulate it will form a bridge across from one part of the frame to another, and the current will be conducted across this circuit instead of through the arc. If the lamps are suspended on poles for outdoor lighting, it will be necessary for the positive and negative cables to run alongside each other at and about the poles, and to have a certain amount of slack to allow of the lamp being lowered and raised, for trimming, etc. These portions of the cables will require considerable attention, because if the insulating material becomes worn the defective parts will be liable to come together, and so cause a short circuit. With outdoor lighting it will also be found that the lamps work unsteadily, and the armatures get hotter than usual when there is heavy rain or mist, because the insulation in time becomes saturated with water, and all the weak places will be more or less short circuited. The insulation of the cables should be especially looked after where they are carried over girders or other ironwork, such as found at railway stations, warehouses, etc.

With regard to the mechanical details of the installation, it should be noted that the belts must be carefully attended to. It is a great mistake to keep the belts too tight, as this causes the armature spindle to bear too hard against one particular part of the bush, and, therefore, causes heating. On the other hand, if the belt is too slack there will be a certain amount of slip, so that the armature will not be revolving at the proper speed to generate the necessary electro-motive force. The joints in the belts should also be neatly made so as to run as smoothly as possible over the pulley. The lubricators should be adjusted so as not to feed any faster than is absolutely necessary to keep the bearings in good order, as any additional oil accumulates dirt and will gradually work round on to the armature coils. Of course, the bearing nearest the pulley will require most attention, because it will have the pull of the belt on it. The engine must be kept in good repair, and the governors kept clean and properly adjusted, so as to insure steady driving, because it should be noted that where belts are used it is usually the case that the armature of the dynamo is geared up to many more revolutions per minute than the engine, so that a comparatively slight alteration in the speed of the engine means a much greater difference in the speed of the armature, so that if the engine, and, therefore, the dynamos, are controlled within reasonable limits, the lamps will jump, no matter how carefully they may have been adjusted. Where there is other machinery supplied from the same boilers, it is best to run a separate steam pipe direct from the main boilers to the engine driving the dynamos, because, owing to the large capacity of the boilers, any variation of the speed o the other machinery will not appreciably affect the regular supply of steam to the electric light engine.

In actual practice there are many slight defects met with in addition to those mentioned in this article, but the writer has endeavored to give an explanation of some of the most important, and how to deal with or avoid them, and shall be glad if the descriptions given should prove o service to any of those who may be called upon to take charge of an arc light installation. The statements made are all the results of his own experience with a large arc light installation.

The Suez Canal and Russian vs. American Petroleum.

The recent admission of tank steamships to the Suez Canal is conceived in the interests of the Russian oil trade; therefore a report from the English Consul at Batoum is especially interesting in this connection.

Before giving data from it, however, a word or two with reference to the admission of bulk petroleum steamers to the Suez Canal is in order. The new traffic is attended with two grave risks, heretofore considered of such importance that until now no steamer carrying bulk petroleum has ever been allowed in this canal, with its narrow banks, its crowded shipping, and its high temperature at certain seasons of the year. There is, 1st, the danger of fire or explosion on board the tank steamer itself, if she have her tanks full or if they have been ineffectually cleaned; 2d, there is the risk of the escape of petroleum from the ship through leakage, collision or grounding.

The present fleet of tank steamers is not one of very great numbers, comprising only about 100 all-told, and of these about 30 are used in the Russian trade; the rest carry oil from New York and Philadelphia to the ports of Europe. The advantages of carrying oil in bulk over the more common way of transporting it in barrels and cases are very great. On this subject Mr. Martell, the chief surveyor of Lloyds and an unquestioned authority on the subject, says, if a steam vessel that could carry 2,000 tons of cargo, occupying as a limit 50 cubic feet to the ton, were filled with petroleum in barrels, she would carry only 1,250 tons dead weight. But about 16 per cent. would represent the tare of the casks, thus reducing the actual amount of petroleum to 1,050 tons. From this, again, it is usual to deduct 2 per cent. for leakage, which reduces the net weight of oil to about 1,030 tons, as against 2,000 tons of ordinary dead weight cargo.

Now let us see what the trade was last year, first in Russian petroleum and then in United States petroleum. Batoum, the oil port of Russia, is a seaport town of Asiatic Russia, on the Eastern shore of the Black Sea, and depends for its commercial prosperity upon the amount

of oil brought down from Baku for shipment. Baku is a port on the western shore of the Caspian Sea, and is connected with Batoum by a railway some 500 miles long, over which the petroleum is transported.

Last year, the report states, 32 tank steamers went to Batoum, of which 25 were English, 3 Russian, 3 Belgian, and 1 German. They made 209 visits and took away in all 244,614 tons of petroleum. On the other hand, no less than 362,426 tons of oil were exported in cases. This gives a total of 607,040 tons. It is evident from these figures that, as matters now stand, the case trade is considerably greater than the tank trade, but the tank steamers are so economical that their employment for the trade with the East, now that the Suez Canal is opened to them, must eventually overcome all opposition. This needs little demonstration when it is stated that each case which contains 8 gallons involves an expense of something like 5 cents per gallon. As regards carrying capacity, 51 cases, or 408 gallons, are taken per registered ton, while in tanks 500 gallons per registered ton can be carried. Practically, therefore, the tank steamer takes 25 per cent. more oil, and avoids besides the cost of the cases. In the case of the storage of barrels this increase, according to the data given before, would amount to nearly 50 per cent. in favor of the tank ship.

The one great competitor of the United States in the production and exportation of petroleum is Russia, with her oil mills at Baku. Last year the total amount of crude oil produced at Baku was 4,670,000 tons. Of this, over 4,000,000 tons were piped to the refineries, where 1,170,000 tons of refined oil were produced. Of this amount 745,000 tons went to Batoum; the remainder went to Russia by way of the Caspian. Of the quantity sent to Batoum, 82,000 tons went to Russian Black Sea ports, while 670,040 tons were distributed as follows by case and tank ships:

	Tons.		Tons.
England	127,011	Roumania	5,149
India	132,591	Bulgaria	3,716
Turkey	100,746	Servia	359
Austria	29,253	Holland	5,536
Germany	2,259	Malta	3,233
Belgium	45,739	China	44,462
France	3,042	Japan	23,675
Italy	35,772	Batavia	44,477

It will be seen from the above figures that India is the largest foreign customer of the Russian petroleum, with England not far behind her. It is also observable that a great deal of refined oil is shipped to China, Japan and Batavia, Java. As the production and demand now stand, some 250,000 tons of petroleum, roughly speaking, would find their natural course through the Suez Canal, and it may be premised that this represents probably the extent to which the opening of that waterway to tank vessels would benefit this particular type of cargo steamer.

It should be borne in mind, however, that the Russian oil trade has been developed within a comparatively recent period, and that it has probably a great future before it. The likelihood is that the exports to the East via the canal will tend to increase considerably, especially as there is no indication at present of any decline in the output at Baku. It behooves shippers of petroleum in the United States to keep a watchful eye on this Russian trade. Already serious inroads have been made on American refined oils, and the outlook is that the United States petroleum exports, which a few years back controlled the world, will be compelled to occupy a second place.

Cheap carriage by land and sea is absolutely essential to success, and the Russians have been wise enough to see this.

The petroleum products of the United States are shipped in barrels and cases, and also in tank steamers. There are at this writing some 70 steamers engaged in transporting oil, principally from New York and Philadelphia to several of the ports of Europe. The main ports in England where tank steamers discharge are London, Liverpool, Hull, and Sunderland, these being the only places where large tanks are provided for the storing of the oil. Amsterdam and Rotterdam are the Dutch ports, Antwerp the Belgian, and Havre, Cette, Marseilles and Bordeaux the French ports.

These steamers, flying the English, Belgian and German flags, are nearly all chartered by the Standard Oil Company, and it is estimated that they carry something like 5,000,000 barrels of oil yearly.

From the Treasury Department's Reports on Foreign Commerce, etc., the following figures of the export of mineral illuminating oil are abstracted. The data in the book give the number of gallons of oil exported, but, in order to compare the United States trade with that of Batoum, this has been reduced to tons, allowing 250 gallons of oil to weigh 1 ton. The total amount exported for the year ending June 30, 1891, was 2,284,478 tons, valued at $40,221,201.

The quantity of American oil exported to the foreign countries which also received Russian oil was as tabulated below:

	Tons.		Tons.
England	324,104	France	15,058
India	158,638	Italy	83,822
Turkey	1,580	Holland	219,516
Austria	2,868	China	108,642
Germany	648,748	Japan	124,002
Belgium	129,588	Batavia	86,532

The only countries to which the United States did not export petroleum were Roumania, Bulgaria, Servia, Malta, Bolivia and Russia. The amount retained for home consumption was about 4,000,000 tons.

Of the oil transported to countries other than Europe, the bulk went in sailing ships, put up in barrels or in cases.

Not a gallon went through the Suez Canal. Indeed, during last year but a single American ship passed through the canal, and she was a man of war.

A final word concerning the Baku wells. There are 315 producing wells, yielding as much oil as can possibly be handled. The outlook is yet more promising this year than last, the first two months showing an increased shipment of nearly 50 per cent. over the corresponding period of 1891.

Producers and exporters of petroleum have here before them official facts. It remains for them to adjust rates so as to crowd out their competitors.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, July 9, 1892.

The Gas Institute Meeting.—Prices of Coals, etc.—Everyday Gas Analysis.

The meeting of the Gas Institute, which was held on the 12th–15th ult., was in every way a success. The attendance of members was large and well sustained throughout, and under the skilled generalship of Mr. W. A. Valon, of Ramsgate, the President, the proceedings were carried through without flagging on the one hand, or undue haste on the other. It is not always possible, with the best management, to make the business fit accurately to the time available for it; but no one was ever so fortunate as to find this important matter able to adjust itself, and, therefore, when the proceedings go through evenly, and the interest of the audience is held throughout, no small share of the credit is due to the Chairman of the meeting. With regard to the papers read, the Council were fortunate in having an excellent variety to place before the meeting, which they arranged to the best advantage. Commencing with the contribution of a young member, Mr. Dexter (from which fact the younger members of the Institute may take a hint that their endeavors will receive every possible encouragement and assistance from the Council), that treated of the use of steam in connection with the purification of gas by means of oxide of iron, the meeting passed on to consider the composition of gas, the difficulties of tank construction, the chemistry of a gas flame, the construction of gas works, the subject of carbureting gas, photometrical standards, and mathematical problems in connection with the guide framing of gasholders.

As a counterpoise to this substantial programme, no one will deny that something in the way of recreation was called for, and this was afforded by a conversazione and dance, on the evening of the second day, and by a day's excursion to Windsor Castle by way of a finish. The reception was arranged throughout in a most elegant manner, and the Institute was indebted for it to the hospitality of the President and Mrs. Valon.

A prominent feature of the meeting was the Murdock centennary lecture, which was delivered by Prof. Vivian B. Lewes, and amply illustrated by means of experiments. The lecturer devoted his attention to the appliances used for the consumption of gas for lighting purposes, commencing with the jet and the perforated thimble, as first used by Murdock in 1792, and tracing the gradual development of the union jet, the batwing, and the Argand burners down to the present day. The history of the regenerator and incandescent forms of burner was also followed. And these apparently dry subjects were so clearly and animatedly put before the audience that the reading of the published report of the lecture seems a very tame affair as compared with listening to its delivery. Prof. Lewes is evidently a born scientific lecturer.

With regard to the papers read, it would be invidious to particularize. The whole of them must come as a great surprise to those who say

that gas matters are already thrashed out and pumped dry, and that much of the talk at gas managers' meetings is necessarily of a nature as light and airy as the commodity they supply. For, perhaps, the chief charm of the 1892 meeting of the Gas Institute was the suggestiveness put forth in the subjects treated, showing that those who, like Alexander, are inclined to weep because they think there are no more worlds to be conquered, may buckle on their armor and attack several topics, about which further information and experience are required.

The President for the year ensuing is Mr. Denny Lane, of Cork, and there was a very strong feeling that the 1893 meeting should be held on Irish soil. Although many believe that it would be better if the meetings were held in London, as putting a more business-like tone on the proceedings—for, somehow, if the meeting is fixed in the neighborhood of popular watering places or picturesque tracts of country, directors *will* gather the impression that the business will be subordinated to recreation—the expression in favor of a visit to Ireland was so strong that no dissent was raised. Belfast was proposed, and when Mr. Travers, of Cork, in response to a question as to the hotel accommodation in that neighborhood, glanced mischievously at some of the members who came in late and expressed the opinion that there would be a better meeting if the hotel accommodation was not quite so good, the thing was as good as carried, and there was no alternative but to bow gracefully to the wishes of the majority and agree that the next meeting should be held at Belfast. One advantage of this arrangement is that Ireland is on the way to Chicago, and perhaps some of the members, having got so far, will take a trip to the great Exhibition. Mr. Longworth retires from the Honorary Secretaryship, and is succeeded by Mr. Hepworth, of Carlisle, who so ably preceded Mr. Valon in the presidential chair.

A feature that should not be overlooked was the opportunity for inspecting the arrangements at the principal distributing station of The Gas Light and Coke Company, afforded to the members by the courtesy of G. F. Foulger, Esq., Chief Distributing Engineer to the Company. The system of mains by which the city of London is supplied with gas has long been noted in gas circles, from the fact that alterations are carried on with very little interference with the supply, and especially on account of an accident which happened a few years since. The failure of a bridge caused the breakage of a 36-inch main, and the damage was repaired in a few hours, with very little loss of gas or interference with the supply. When we think of the viaducts, bridges, tunnels, subways, and many other structures that tend to interfere with the network of pipes so ably cared for by Mr. Foulger and his subordinates, we cannot but wonder that accidents are so rare, and that the unaccounted-for gas is kept below 5 per cent. But after visiting and inspecting the really magnificent sets of valves and connections at Goswell road, our wonder gives place to admiration of the systematic manner in which the wants of the London gas consumers are cared for.

The market for gas coals is, on the whole, somewhat in favor of the purchaser, as compared with the prices that have been prevalent during the last twelve months. Several contracts have been taken at prices representing 1s. to 1s. 6d. per ton reduction, as compared with last year. But against this, it will be remembered that the residual market is not in a satisfactory state. Stocks of coke are increasing, and tar, liquor, and sulphate of ammonia are all at a low ebb. On the whole, therefore, it cannot be said that the position is improving; and the managers of gas works will have quite as much difficulty to contend with in the ensuing as they had in the past winter, in the matter of prices of materials and residuals. There is a general disposition to avoid any increase in the price of gas, as likely to interfere with the demand. For gas is now used for many technical purposes, in addition to its original application as a source of artificial light. And the increased consumption that has been a noticable feature during the last few years is more to be credited to the introduction of gas fires, gas engines, and various kinds of gas burners for technical purposes, than to larger or to additional burners for lighting. An increase of price, however slight, must have a tendency to throttle this advancement. And therefore the general rule is to endeavor to make both ends meet, by the exercise of every possible economy in repairs and renewals, and by looking to the economies that result from increased business as a counterbalance to the increased cost, both of materials and labor. Those who have been able to hold their own so far, will probably be able to tide over the coming winter. It should also be mentioned that the difficulties that have oppressed gas companies have also made themselves evident in the case of suppliers of electric light. The prices charged by London Electric Light Companies have been the matter of serious complaint, while on the other hand the shareholders have to look to the prospects of future development for their dividends. And where electricity is supplied on the small scale, as in little country towns, the result is unmistakable. The Electric Company at Fareham, for instance (a little town of 2,000 inhabitants), have to record a loss equal to about half of their income for the year 1891. The price of coal appears to be a more serious matter to the suppliers of electricity than to gas companies.

I was interested in reading a paper on everyday gas analysis, read before the Western Association by Mr. W. Stedman, Jr., because I believe, from actual experience, that anyone who will take the trouble to test his gas for impurities, say at the outlet of scrubber, outlet of washers, after the first purifier, and after the second purifier, regularly every week for at least a year, will know more about purifying gas than he will learn from reading all the books on the subject that were ever written. In saying this, I assume that there is a record kept, as there should be on every well arranged works, of the number of changes of purifying boxes, material used in each, etc. I have tried most of the gas burettes brought out, including the form of apparatus alluded to in the paper, which is known over here as "Cooper's tube," but prefer the Wanklyn bottle to any of them. It is rather more difficult to learn in the first place, but once understood can be operated with greater speed and accuracy than any form of burette, especially when testing four or more samples at a time. Let me advise young students to go through a systematic course of experiments in this direction, and to book their results in tabular form for comparison. The results can easily be shown in diagrams also. The most important requirement in connection with cheap and successful purification is to know how much sulphureted hydrogen and carbonic acid is required to be removed.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. H. F. Coggshall, Treasurer and General Manager of the Fitchburg (Mass.) Gas and Electric Light Company, writing to the Journal under date of July 18th, in reference to an item that appeared in our issue for last week regarding a sale of shares in the Fitchburg Company, says: "I notice a short item in your issue of this date which is a little off-color. The fault is my own. I should have given you the facts, but did not think it of importance to do so. The facts were that, having more debt than we liked, our stockholders voted to increase our capital stock $50,000, by issuing 1,000 shares, par value $50 each, and to sell the same at auction to the highest bidder, on July 7th, and having been duly advertised, I engaged Mr. Staples to sell the same. The terms were cash, to be paid up by August first, with interest at 6 per cent. to that date. It was all sold in 20 minutes, at $75 per share, to 28 different shareholders, and while they had until August first to pay for same, at this writing all but 2⅞ shares have been taken and paid for. I should add that while the stock is not very good, it shows that *money is easy*." No doubt, Mr. Coggshall, money is always easy when it goes into a good thing.

The proprietors of the Fort Scott City (Kansas) Gas Company have put out a great many gas cookers this season, and have adopted an ingenious system of advertising in connection therewith.

General Hickenlooper, having agreed with the authorities over the gas rate that is to rule in Cincinnati for the next decade, has departed with his family for a lengthy Western trip. The route is to Yellowstone Park, thence to Tacoma, and to Sitka, Alaska. The voyagers will return by the Canadian Pacific.

The Council Committees on Light and Ordinances, of Manchester, Va., some days ago, gave another hearing on the application made by Mr. W. J. Winegar and associates for the right to establish a gas plant in the city. The conference resulted in the determination of the Committees to recommend to the Council that the franchise be granted.

In continuation of our former mention of the case of the people of St. Louis against Gustave Tempel, held on the charge of having stolen electricity, we can say that defendant was discharged. The Judge would not concede that the offense was petit larceny, and the Grand Jury refused to say that the crime was in the nature of a fraud, so when the case came up for trial the defendant was discharged. It will be remembered that Tempel was accused of having tapped an electric lighting wire for the purpose of illumination without paying therefor.

According to the St. Louis *Globe-Democrat*, of July 16, there were 20 members present at a meeting of the House of Delegates, on the evening of July 15th, Speaker Ward occupying the chair. Mr. Ward

introduced a bill regulating the price of gas. The measure provides that the price of illuminating gas shall not exceed 85 cents per 1,000 cubic feet, but should the bills be not paid promptly on the first of each month, 90 cents may be charged. The price of power and fuel gas is fixed at 40 and 45 cents, respectively. Any charge in exeess of the prices named is made a misdemeanor, punishable by a fine of $250 for each offense. The matter was referred. Mr. Egan also introduced a resolution asking for the appointment of a committee of three to ascertain if the Municipal Electric Light and Power Company is carrying out its contract with the city. It was claimed that ordinances ordering the erection and maintenance of 500 additional arc lights had been ignored. The resolution was adopted, and Messrs. Egan, McGroarty and Schrenbeck were appointed the Committee.

Mr. R. F. Fitz, manager of the Elgin (Ills.) American Gas Company, informs us that Miss M. A. Stewart, of 49 Du Page street, that city, was the fortunate person to receive the $25 in gold coin, put up for competition among the housekeepers by the Gas Company, for the best specimen of cake baked in a gas range. Miss Stewart used an American Meter Company's Economy Cabinet Gas Stove. The competition was taken part in by at least 50 matrons and maids.

"C. F. P.," forwards the following, which explains itself fully: "The annual meeting of the Massachusetts Electric Lighting Association was held at Hotel Pemberton, Nantasket Beach, Boston, on Tuesday, July 12th. The annual reports of the officers showed that a large amount of work had been done in protecting and advancing the electric lighting interests of the State, and with it the interests of gas lighting, which in most cases were identical; and the President showed his appreciation of the way the officers of the various gas companies, although not members of the Association, had responded to his letters, and had thus aided the work materially. Of the matter put before the Legislature the past winter the number affecting the gas companies was larger than the number affecting the electric lighting companies, and the number affecting both was larger than the number affecting either. Realizing the importance of the work done, several gas companies have applied for admission, and the Association on its part, recognizing that in such cases numbers produce strength, decided to change the name to The Massachusetts Electric and Gas Lighting Association, and its constitution, so that gas companies could become members. An article was incorporated in its constitution whereby three of the nine Directors should be men who represented solely the gas industry, and had no allied interests, and under whose charge the matters which affected the gas interests are to be placed. After a very excellent fish dinner, two most excellent papers were read, by Mr. F. E. Barker, of the State Board of Gas and Electric Light Commissioners, and Mr. C. L. Edgar, of the Boston Edison Electric Company, respectively. A spirited discussion followed, and the next number on the programme was a visit to Station 3 of the Edison Company, of Boston. That there is room for an Association of this nature, which aims to promote the general business interests, as distinct from the more purely engineering Society, is indicated by the efforts which have been made in the past to have the Gas Associations take up this branch of the work.

In the first line of the article on "The Properties and Manufacture of Celluloid," printed in the last issue of the Journal, p. 77, the word *vitiating* is used instead of the word *nitrating*. The amended sentence is, "Celluloid is made from cellulose, which, having gone through a *nitrating* process, is dissolved," etc.

The *Sun*, of the 20th inst., contained the following: "The Edison Electric Illuminating Company, of Rochester, N.Y., and the Rochester Electric Company, have been consolidated, and the new Company has acquired the Brush Electric Company, and the Gas Company has been merged. The title of the consolidated Company is the Rochester Gas and Electric Company, and it will have the following officers: President, J. Lee Judson; First Vice-President, William Runkle; Second Vice-President, Frederick Cook; Chairman of Executive Committee, R. A. C. Smith; Treasurer, G. C. Archer; Secretary, George C. Hollister; Assistant Secretary and Treasurer, H. G. Runkle. The capital of the consolidated corporation will be $4,300,000, of which 21,500 shares are to be preferred, bearing 6 per cent. cumulative dividend. The stockholders of the Rochester Gas Company will receive 20,500 shares, the stockholders of the Edison Company 6,000 shares, and the stockholders of the Rochester Company 4,000 shares, in each case one-half common and one-half preferred. The Directors are authorized to employ the stock remaining in the treasury for the purchase of not less than two-thirds of the capital of the Brush Company. The consolidated corporation is to assume the mortgage obligations of the constituent Companies."

We are indebted to Mr. Henry W. Sage, Secretary of the Cincinnati Gas Light and Coke Company, for the information that, on the 16th inst., the new lighting contract between the city and the Company became operative. The Company agrees to supply gas to public buildings and private consumers for 10 years, at $1.10 per 1,000 cubic feet, less 10 cents per 1,000 for prompt payment. So we have another member in the dollar gas circle.

The proprietors of the Kenosha (Wis.) Gas Company will sue the city for $1,000, the value of gas that was lost from the mains because of the negligence of the contractors who were constructing a system of sewers for the city.

The Commercial Natural Gas Company, which proposes to do business at Bradford, Pa., of which Mr. J. H. Ralph is President, has promulgated the following schedule of rates:

	Monthly Rate.	Yearly Rate.
Cook stove	$1.25	$12.00
First heating stove	1.50	8.00
Second heating stove	1.10	6.00
Third heating stove	.75	4.00
Each additional heating stove	.75	4.00
Furnace—two ½ mixers	3.00	15.00
" —three ½ mixers	3.75	20.00
" —four ½ mixers	4.25	24.00
Lights—1 to 5 each	.10 each	1.08
" —5 to 15 "	.07½ "	.81
Each additional light	.05	.54

The authorities at Springfield, Ohio, have passed an ordinance under which the local natural gas company is authorized to receive in payment for gas supply 20 cents per 1,000 cubic feet. The ordinance, which is to live for three years, goes into effect on Sept. 1.

The Berlin Iron Bridge Company, of East Berlin, Conn., has received the contract for the new tin plate works which Hughes & Patterson are to erect at Philadelphia, Pa. The buildings will be of iron, from the designs of the Berlin Company. The main building will be 40 feet wide by 253 feet long, with a wing of the same width 300 feet long, both two stories high. The rolling mill will be 120 feet wide by 160 feet long, with an annealing room 75 feet wide by 160 feet long. The whole plant will require about 800 tons of iron to be used in its construction.

At a meeting of the Board of Directors of the Hudson County (N. J.) Gas Light Company, held early this month, the following *in memoriam* resolutions respecting the late Mr. John P. Kennedy were adopted:

Resolved, In the death of John P. Kennedy, Esq., the Hudson County Gas Light Company has sustained a great loss, having been for many years a Director of the Company; his thorough knowledge of the business, his great practical experience, sound judgment, and zealous attention have contributed largely to the success and usefulness of this Company. By his genial manner he endeared himself to his fellow-directors, to the officers of the Company, and to all his associates. We sincerely regret his loss and tender our sympathy and condolence to his family.

Resolved, That the Secretary be and is hereby requested to enter these resolutions in the minutes and transmit a copy thereof to the family of deceased and cause the same to be published in the *Evening News*.

At the annual meeting of the Southbridge (Mass.) Gas and Electric Company, held last Friday evening, the old officers were re-elected, as follows: President, H. C. Wells; Treasurer, C. W. Johnson; Clerk, Edwin P. Wells; Directors, H. C. Wells, Geo. W. Wells, C. A. Dresser, I. P. Hyde, C. D. Paige, H. C. Cady, and J. D. Blanchard.

Some changes have been made in the arrangement for delivering bills and adjusting the discount time in the matter of the gas supply on the north and south sides of Chicago. According to the notices sent out by the Company, on and north of North avenue, between the river and the lake, the delivery of bills will take place on the 18th of the month, commencing August, and discount will be allowed until the 24th of the month. There will be no bills rendered in July. South of North avenue, and between the river and the lake, the delivery will

take place on the 24th of the month, and discount allowed until the 30th. North of Twelfth street, and between the river and the lake, the delivery of bills will take place on the 30th of the month, and discounts allowed until the 6th of the following month. On Twelfth street, and south of Twelfth street, to and including Thirty-first street, and between the river and the lake, the delivery will take place on the 6th, and the discount allowed until the 12th of the month. South of Thirty-first street, and in Hyde Park, the delivery will take place on the 12th and discounts allowed until the 18th of the month.

At a meeting of the shareholders of the Municipal Gas Company, of Albany, N. Y., held on the morning of the 19th inst., it was resolved to increase the capital stock, from $1,500,000 to $2,000,000, the increase to be applied to the purchase of the capital stock of the Albany Electric Illuminating Company.

The Humane Society, of Baltimore, Md., has established a "gas chamber" at the rear of one of the public temporary resting places in the city, known as "The Shelter." Hereafter, when it is necessary to put an animal to death, the victim will be brought to the "gas chamber," and the vapor turned on.

Mr. William G. Pierce has been awarded the contract for the erection of the new office building for the Wilmington (Del.) Gas Company.

It is quite different in Pennsylvania—that is, in Missouri a man charged with tapping an electric light wire, for the purpose of securing illumination without paying anything therefor, is discharged from custody on the ground that the grade of his crime cannot be fixed. On the other hand, Magistrate Romig, of Philadelphia, recently fined John Roach and Alexander McGargle $10 each for "illegally tapping" an electric light wire for the purpose of illuminating a saloon at Callowhill and 19th streets.

We are indebted to a Washington (D. C.) correspondent for the following: "The corporation laws of Alexandria, Va., have always been leniently administered, and even in stricter business matters discounts have been allowed and penalties waived as far as was possible. The working of this method in relation to the city gas works has led to a proposal by the Committee on Light to increase the receipts of the gas works by changing its methods. Under the law gas is sold at $1.60 per 1,000 feet, 'with 10 per centum discount for prompt payment, but no discount shall be allowed on any gas bills, unless paid on or before the 15th of the month succeeding that in which the meter is taken, and when not paid within 10 days after that date the Superintendent shall cut off the supply of gas.' This law is printed on the back of the gas bill, but it was stated at the last meeting of the Aldermen that the discount had been allowed even in cases where the payment of gas bills had been deferred for months. The novel remedy is proposed of lowering both the price of gas and the rate of discount, and fulfilling the new law to the letter. At present the gas rate is $1.60 per 1,000 feet, with 10 per cent. discount, or a net rate of $1.44; and it is proposed to fix the rate at $1.50 per 1,000 feet, with 5 per cent. discount, making the price to prompt payers $1.42½ per 1,000. It was said that as a majority would not pay promptly, the diminution would, in effect, bring in more money, as on most of the gas $1.50 would be paid, instead of $1.44, as now. The new method will probably not go into effect until after next October."

In the meantime purchasers of gas tar are reminded that the Light Committee, in charge of the Alexandria (Va.) gas works, will receive bids for the tar, up to Saturday next.

The following are the figures submitted by the Connecticut Electric Company of Waterbury in response to the city's invitation for bids for the public lighting for one year, from February 1st, 1893: 150 arcs, to be kept alight not less than 26 nights per month, at 39 cents per lamp per night, and 36 incandescents (32-candle power) at $25 per lamp per year. Of the arc lamps, 100 are to be of 2,000-candle power, nominal; the remaining 50 to be of 1,200-candle power.

Mr. D. U. Chamberlain, President of the Cambridge (Mass.) Gas Light Company, was recently appointed Chairman of the Committee on Public Parks.

The Directors of the Leominster (Mass.) Gas Light Company have declared a semi-annual dividend of $2 per share.

At the annual meeting of the New London (Conn.) Gas Light Company the following officers were chosen: President, A. C. Lippitt; Secretary and Treasurer, C. C. Lippitt; Directors, J. N. Harris, Augustus Brandegee, Robert Coit, L. E. Lippitt, A. C. Lippitt, E.W. Lippitt and C. C. Lippitt.

Another "item" from St. Louis about the proposed new Gas Company there is as follows: "A few days ago the House Committee on Public Improvements met and devoted a short time to the consideration of the new gas bill, which was introduced by Delegate Siegmund on May 20, authorizing John Maguire, Perry Bartholow, John B. Taylor and others to construct and operate a plant for supplying gas and electricity for fuel, power and illuminating purposes to consumers in the city. The bill provides for supplying illuminating gas at 90 cents per 1,000 cubic feet, and gas for fuel at 45 cents per 1,000 cubic feet. Four of the promoters of the bill were in attendance. The bill is in a crude state, and many amendments will probably be made before it is placed before the Municipal Assembly."

At the annual meeting of the Milford (Mass.) Gas Light Company the following officers were chosen: Treasurer, B. E. Harris; Secretary, L. H. Cook; Directors, C. F. Claflin, B. E. Harris, J. B. Bancroft, J. N. Davis, N. B. Johnson, E. L. Wires, F. J. Dutcher, G. A. Draper, J. E. Walker and L. H. Cook.

The following, from the Brooklyn *Eagle* of the 12th inst., is given for what it is worth: Mr. J. Edward Addicks gave another example this morning of how skilled a tactician he is in gas company warfare by having himself elected to the Presidency of the Brooklyn Gas Company. When he succeeded a few weeks ago in securing the possession of a majority of the stock of that Company it was considered by financiers as one of the most brilliant victories in the financial history of Brooklyn. But with it won there was still doubt as to the policy Mr. Addicks would pursue. He was not even in the Board of Directors, and he could not force himself in by the power of the stock he owned until next January, unless the Board would consent to elect him. Would the Board leave him out until that meeting, or would they take him into the fold and allow him to become master? These questions bothered the gas sharps not a little. There was a meeting last week of the Board of Directors, and most of the shrewd prophets predicted Mr. Addicks' election. To their surprise nothing was done and they had about reached the conclusion that Mr. Addicks would be left in the cold until January. This morning at 9:50 o'clock there was a meeting of the Board of Directors of the Brooklyn Company. All of them were present with the exception of Mr. Polhemus, who is summering in Maine. The first thing done was to elect Mr. Addicks a member in the place of William Carey Sanger, who resigned quite early in the year. After his election President Lyman's resignation from that office was received, and then by a unanimous vote Mr. Addicks was elected to fill it. After a half hour spent in conferring with the other Directors, Mr. Addicks was introduced to the clerks in the office, and in a few minutes left the building. Among those who congratulated the new President were Crowell Hadden and Cyrus Staples. Mr. Staples told an *Eagle* reporter he understood that Mr. Addicks intended to take a friendly position toward the other companies and while keeping the main object of eventual consolidation well in view, hoped to accomplish it by seductive rather than by aggressive means. He said it was too early in the day to have any idea of what the effect on gas stock would be. Another interesting bit of news from the Gas Company is the sale yesterday of $100,000 worth of bonds by the Metropolitan Company. Much curiosity was quickly manifested by the different gas companies to know for what purpose the money so raised was to be used. A reporter called upon President George H. Stoddard this morning to try and obtain that information. He said that the sale of bonds was a successful one, but politely declined to give the prices which they brought. "The issue of bonds," he said in response to questions, "is for the purpose of equipping our works with the Wilkinson process of making water gas. That is the same method which is being adopted by the Nassau Gas Company. At present we obtain all our gas from the Fulton Municipal, and pay them 60 cents a thousand for it." "Are you going to throw up your contract with that Company?" "It looks very much like it." "When does your present contract expire?" "I can't tell you that." Mr. Stoddard has been in the gas business for a long time and is thoroughly familiar with the various processes. He has probably come to the conclusion that he can make his own gas and sell it at a greater profit than he can the Fulton Municipal gas, for which he pays 60 cents a thousand. Inquiry at the office of the Fulton Municipal Company this morning brought to light the fact that there had been correspondence between the two Companies concerning the contract. None of the particulars could be learned.

The Market for Gas Securities.

The market for city gas shares is very dull, but prices are well maintained. Consolidated is at 114¼, with neither offerings nor inquiries for business on cash account. In Brooklyn the situation is practically unchanged, although nominal quotations are somewhat higher, especially so in the instances of Metropolitan and Peoples. Chicago gas is strong, at 81 to 81½, as is Baltimore Consolidated, which is now at the 60 mark. Again we say, these shares are cheap at the market price. The new issue of Consumers, of Toronto, does not seem to have affected the value of the whole, as 190 is freely bid for it. The general situation is noted for stagnation.

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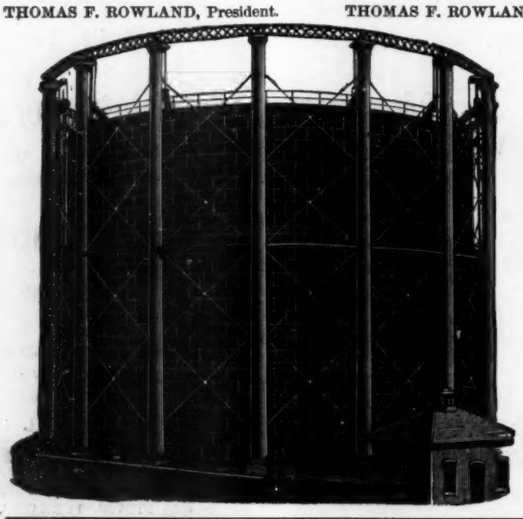

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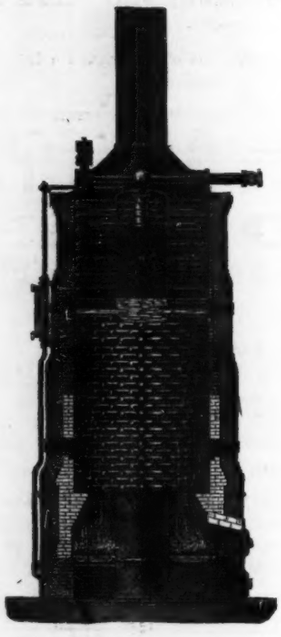

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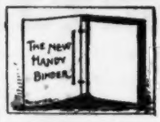

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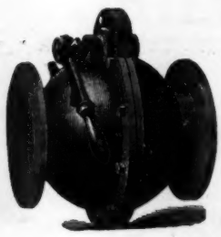

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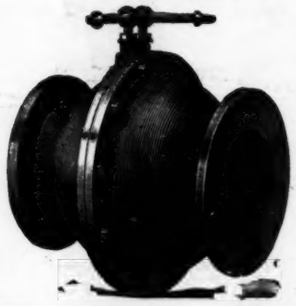

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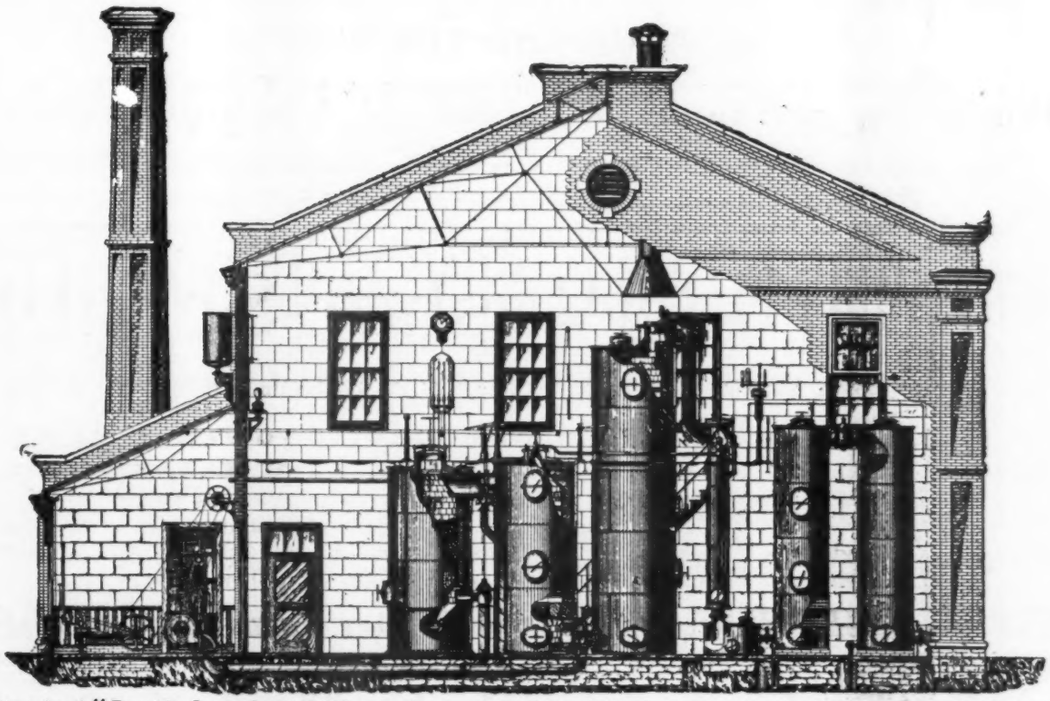

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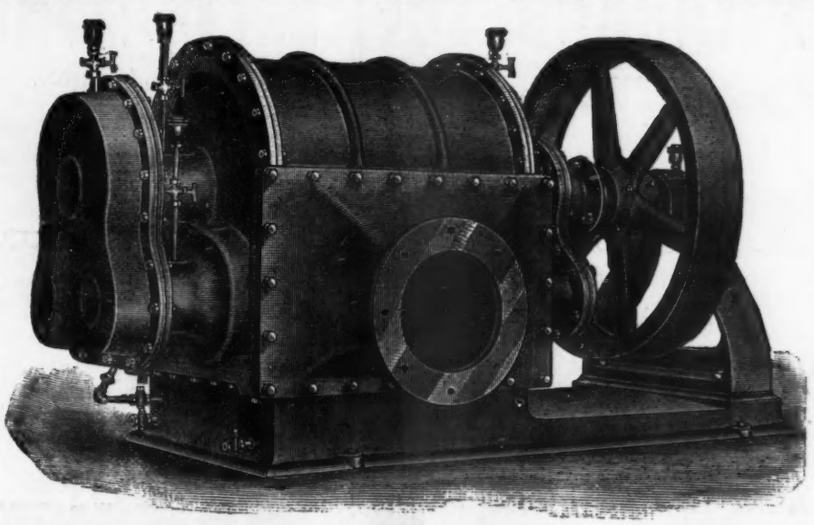

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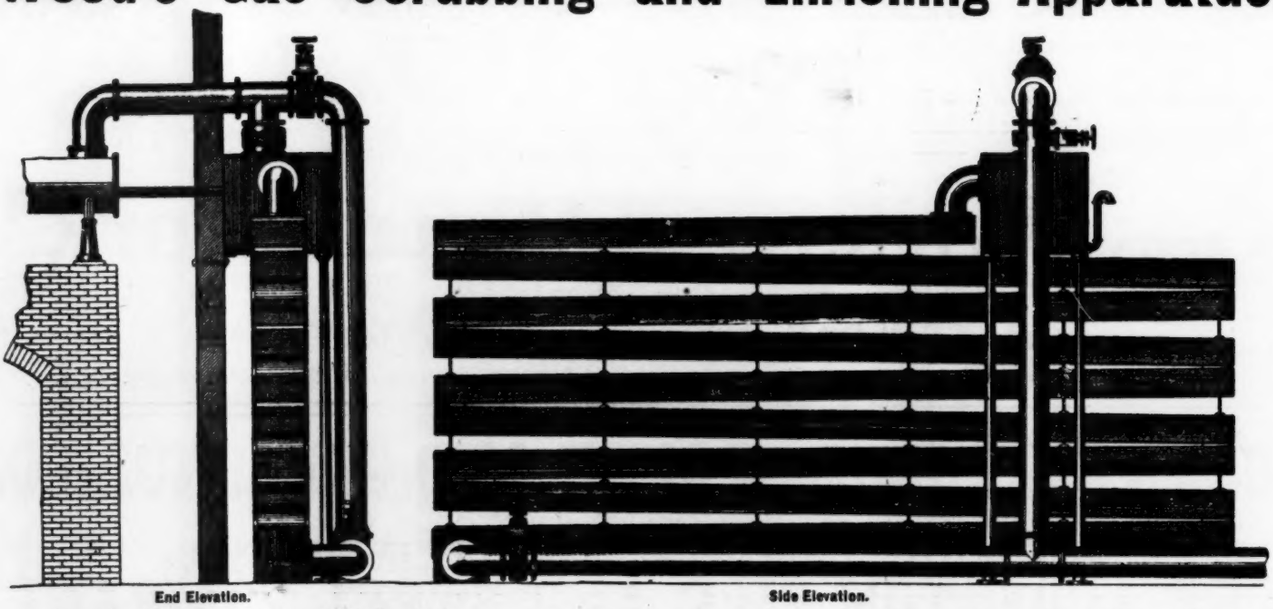

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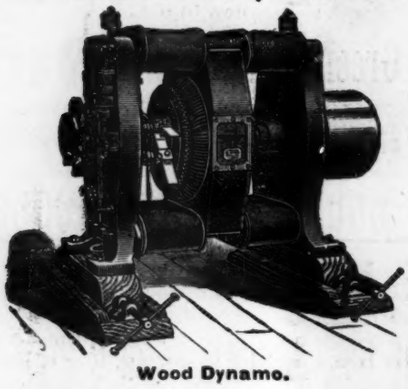

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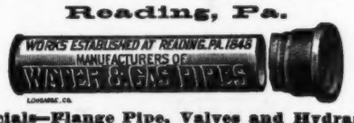

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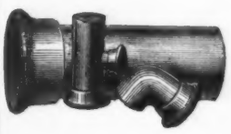

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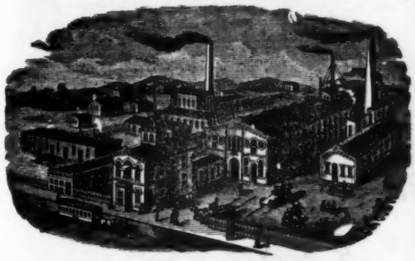

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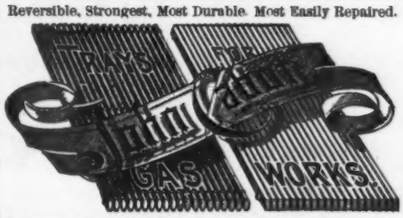

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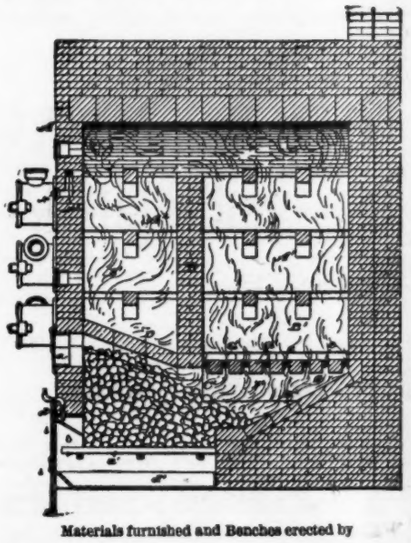

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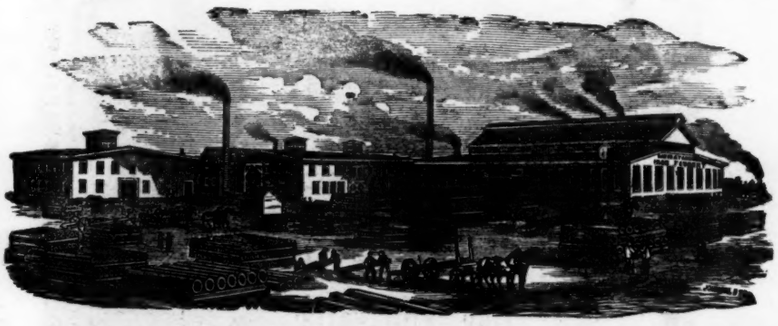

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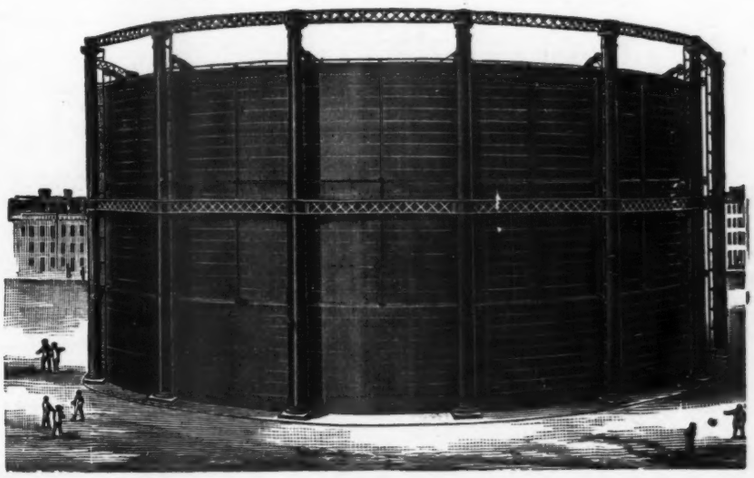

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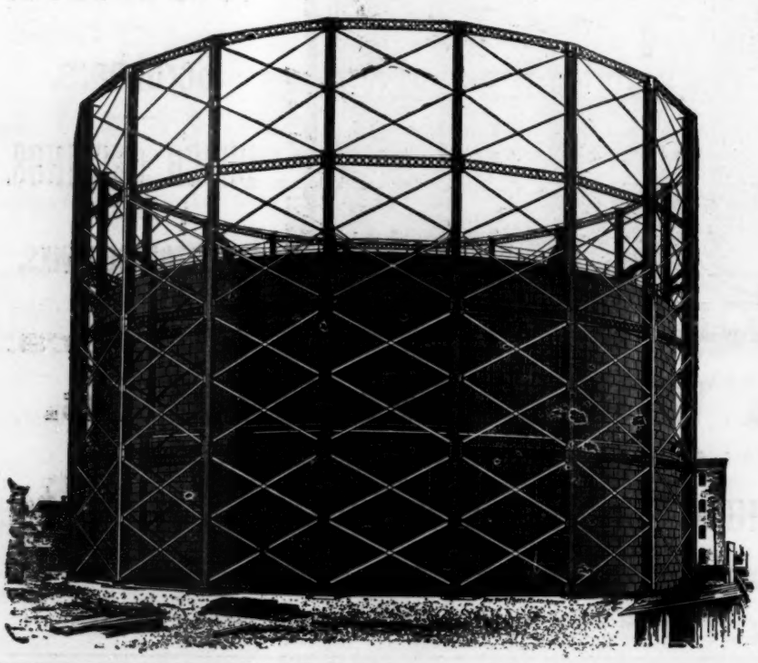

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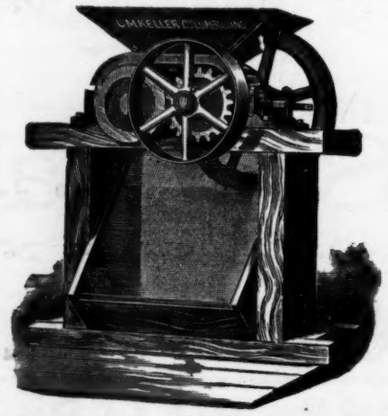

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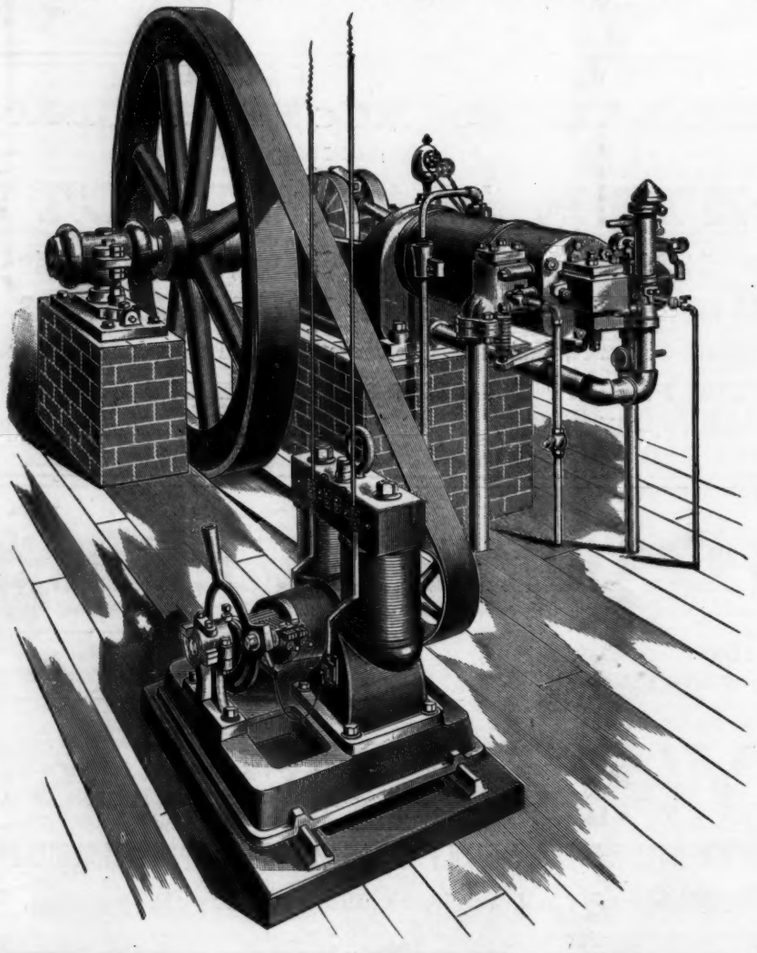

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